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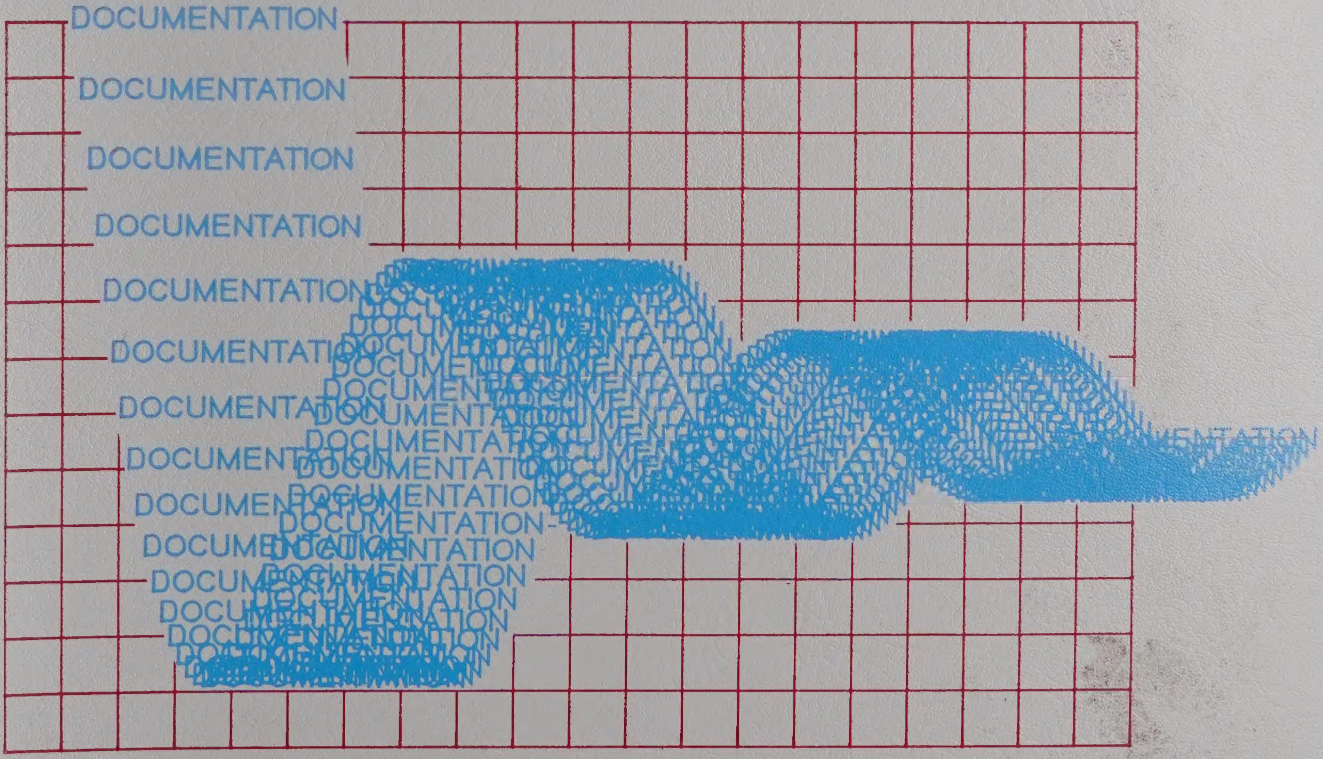
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ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

Software Options:
TDMA800/1900-MS for CMU-B21

CMU-K27/-K28

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Tabbed Divider Overview

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Certificate of Quality
List of R&S Representatives

Contents of Manuals for Universal Radio Communication Tester CMU

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Adressen/Addresses

FIRMENSITZ/HEADQUARTERS

	Telefon/Phone Telefax E-mail
ROHDE & SCHWARZ GmbH & Co. KG Mühldorfstraße 15 · D-81671 München Postfach 801469 · D-81614 München Internet: http://www.rsd.de	+49 89 41 29-0 +49 89 41 29-21 64 –

WERKE/PLANTS

	Telefon/Phone Telefax E-mail
ROHDE & SCHWARZ Meßgerätebau GmbH Riedbachstraße 58 · D-87700 Memmingen Postfach 16 52 · D-87686 Memmingen	+49 83 31 1 08-0 +49 83 31 1 08-1 24 –
ROHDE & SCHWARZ GmbH & Co. KG **Werk Teisnach** Kaikenrieder Straße 27 · D-94244 Teisnach Postfach 11 49 · D-94240 Teisnach	+49 99 23 8 50-0 +49 99 23 8 50-1 74 –
ROHDE & SCHWARZ GmbH & Co. KG · Werk Köln Graf-Zeppelin-Straße 18 · D-51147 Köln Postfach 98 02 60 · D-51130 Köln	+49 22 03 49-0 +49 22 03 49-3 08 –

TOCHTERUNTERNEHMEN/SUBSIDIARIES

	Telefon/Phone Telefax E-mail
ROHDE & SCHWARZ Vertriebs-GmbH Mühldorfstraße 15 · D-81671 München Postfach 80 14 69 · D-81614 München	+49 89 4129-20 07 +49 89 4129-35 67 –
ROHDE & SCHWARZ International GmbH Mühldorfstraße 15 · D-81671 München Postfach 80 14 60 · D-81614 München	+49 89 4129-20 05 +49 89 4129-35 97 –
ROHDE & SCHWARZ Engineering and Sales GmbH Mühldorfstraße 15 · D-81671 München Postfach 80 14 29 · D-81614 München	+49 89 4129-37 11 +49 89 4129-37 23 –
R&S BICK Mobilfunk GmbH Im Landerfeld 7 · D-31848 Bad Münder Postfach 20 62 · D-31844 Bad Münder	+49 50 42 9 98-0 +49 50 42 9 98-105 –
ROHDE & SCHWARZ FTK GmbH Wendenschloßstraße 168, Haus 28 D-12557 Berlin	+49 30 6 58 91-0 +49 30 65 55 02 21 –
SIT Gesellschaft für Systeme **der Informationstechnik mbH** Wendenschloßstraße 168, Haus 28 D-12557 Berlin	+49 30 6 58 84-2 22 +49 30 6 58 84-1 83 –

ADRESSEN DEUTSCHLAND/ADDRESSES GERMANY

	Telefon/Phone Telefax E-mail
Rohde & Schwarz Vertriebs-GmbH Mühldorfstraße 15 · D-81671 München Postfach 801469 · D-81614 München	+49 89 4129-2007 +4989 4129-3567 –

Zweigniederlassungen der Rohde & Schwarz Vertriebs-GmbH/Branch offices of Rohde & Schwarz Vertriebs-GmbH

	Telefon/Phone Telefax E-mail
Zweigniederlassung Berlin Ernst-Reuter-Platz 10 · D-10587 Berlin Postfach 100620 · D-10566 Berlin	(030) 34 79 48-0 (030) 34 79 48-48 –
Zweigniederlassung Büro Bonn Josef-Wirmer-Straße 1–3 · D-53123 Bonn Postfach 140264 · D-53057 Bonn	(02 28) 918 90-0 (02 28) 25 50 87 –
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Zweigniederlassung Nürnberg Donaustraße 36 D-90451 Nürnberg	(09 11) 64203-0 (09 11) 64203-33 –
Zweigniederlassung Telekommunikation + Mitte Siemensstraße 20 D-63263 Neu-Isenburg	(0 61 02) 20 07-0 (0 61 02) 20 07-12 –

ADRESSEN WELTWEIT/ADDRESSES WORLDWIDE

Algeria	ROHDE & SCHWARZ Bureau d'Alger 5 B, Place de Laperrine 16035 Hydra-Alger	+2 13 2 592453 +2 13 2 594786 –
Argentina	Precisión Electrónica SRL Esmeralda 582, Piso 4, Off. 11 1007 Capital Federal Buenos Aires	+54 1 3 94 48 15 +54 1 3 27 23 32 –
Australia	ROHDE & SCHWARZ (AUSTRALIA) Pty. Ltd. 63 Parramatta Road Silverwater, N.S.W. 2141	+61 2 97 48 01 55 +61 2 97 48 1836 rsaussyd@ozemail.com.au
Austria	ROHDE & SCHWARZ-ÖSTERREICH Ges. m. b. H. Sonnleithnergasse 20 A-1100 Wien	+43 1 6 02 61 41-0 +43 1 6 02 61 41-14 office@rsoe.com
Azerbaijan	ROHDE & SCHWARZ GmbH & Co. KG Representative Office Baku Azerbaijan avenue 35 370139 Baku	+99 4 12 93 31 38 +99 4 12 93 03 14 –
Baltic Countries	siehe/see Denmark	
Bangladesh	Business International Ltd. Corporation Office House No: 95/A, Block -'F' Road No: 4, Banani Dhaka - 1213	+880 2 87 06 53 +880 2 88 82 91 –
Belgium	ROHDE & SCHWARZ BELGIUM N.V. Excelsiorlaan 31 Bus 1 B-1930 Zaventem Alfons_Verpoorten%RSB@notesgw.Compuserve.Com	+32 2 7 21 50 02 +32 2 7 25 09 36
Brazil	ROHDE & SCHWARZ Precisão Eletrônica Ltda. Rua Geraldo Flausino Gomes, 42-°and 04575-060 São Paulo-SP	+55 11 5505 21 77 +55 11 5505 57 93 rsbras@ibm.net
Brunei	GKL Equipment PTE. Ltd. #11-01 BP Tower 396, Alexandra Road Singapore 119954 Republic of Singapore	+65 2 76 06 26 +65 2 76 06 29 gkleqpt@signet.com.sg

Bulgaria
ROHDE & SCHWARZ +359 2 9 63 43 34
Representation Office Bulgaria +359 2 9 63 21 97
39, Fridtjof Nansen Blvd. –
1000 Sofia

Canada
Kommunikationstechnik/Communications Equipment:
ROHDE & SCHWARZ CANADA Inc. +1 6 13 5 92 80 00
555 March Rd. +1 6 13 5 92 80 09
Kanata, Ontario K2K 2M5 –

Meßtechnik/T & M Equipment:
TEKTRONIX CANADA, Inc. +1 4 16 7 97 50 00
785 Arrow Road +1 4 16 7 47 75 81
Weston, Ontario, M9M 2L4 –

Chile
DYMEQ Ltda. +56 2 277 50 50
Avenida Larrain 6666 +56 2 227 87 75
Santiago –

China
ROHDE & SCHWARZ +86 10 64 67 23 65
Representative Office Beijing +86 10 64 67 23 15
Beijing Towercrest Plaza, Rm 821 rsbp@public3.bta.net.cn
No. 3 Mai Zi Dian West Road
Chao Yang District
Beijing 100016/People's Republic of China

Colombia
Ferrostaal de Colombia Ltda. +57 1 2 67 63 21
Av. Eldorado No. 97-03 Interior 2 +57 1 4 13 18 06
Santa Fé de Bogotá, D.C. –

Costa Rica
siehe/see Mexico

Republic of Cyprus
HINIS TELECAST LTD. +357 4 42 51 78
Agiou Thoma 18 +357 4 42 46 21
Kiti
Larnaca 7550

Czech Republic
ROHDE & SCHWARZ – Praha, s.r.o. +420 2 24 32 20 14
Pod kastany 3 +420 2 24 31 70 43
CZ-160 00 Praha 6 rscz@rohde.mail.602.cz

Denmark
ROHDE & SCHWARZ DANMARK A/S +45 43 43 66 99
Ejby Industrivej 40 +45 43 43 77 44
DK-2600 Glostrup RSDK@post1.tele.dk

Ecuador
DIGITEC Cia. Ltda. +593 2 43 03 73
Casilla 17-03-408A +593 2 44 37 82
El Heraldo 121 y El Dia digitec1@digitec.com.ec
Quito

El Salvador
siehe/see Mexico

Finland
Orbis Oy +358 9 47 88 30
P.O. B. 15 +358 9 53 16 04
FIN-00421 Helsinki info@orbis.fi

France
ROHDE & SCHWARZ FRANCE +33 1 41 36 10 00
Immeuble "Le Newton" +33 1 41 36 11 10
25-27, rue Jeanne Braconnier
F-92366 Meudon-la-Forêt Cédex –

Niederlassung/Subsidiary Rennes:
ROHDE & SCHWARZ FRANCE +33 2 99 51 97 00
Sigma 1 +33 2 99 41 91 31
Rue du Bignon –
F-35135 Chantepie

Niederlassung/Subsidiary Toulouse:
ROHDE & SCHWARZ FRANCE +33 5 61 39 10 69
Technoparc 3 +33 5 61 39 99 10
B.P.501 –
F-31674 Labège Cédex

Büros/Offices:
Aix-en-Provence +33 4 94 07 39 94
+33 4 94 07 55 11
Lyon +33 4 78 29 88 10
+33 4 78 29 94 71
Nancy +33 3 83 54 51 29
+33 3 83 55 39 51

Greece
MERCURY SA. +30 1 7 22 92 13
6, Loukianou Str. +30 1 7 21 51 98
GR-10675 Athens mercury@hol.gr

Guatemala
siehe/see Mexico

Honduras
siehe/see Mexico

Hong Kong
Schmidt & Co. (HK) Ltd. +8 52 2 5 07 03 33
9/F North Somerset House +8 52 2 8 27 56 56
Taikoo Place frankwong@shk.schmidtgroup.com
979 King's Road
Quarry Bay, Hong Kong

Hungary
ROHDE & SCHWARZ +36 1 203-02 82
Budapesti Iroda +36 1 203-02 82
Etele ut. 68 rsh@euroweb.hu
H-1115 Budapest

Iceland
siehe/see Denmark

India
ROHDE & SCHWARZ +91 11 461 52 85/469 22 38
India Pvt. Ltd. +91 11 462 63 24
A-382 Defence Colony –
New Delhi 110024

Indonesia
P.T. REKANUSA SOLUSI +62 21 576 16 02
Menara Rajawali, +62 21 576 16 04
24th floor –
Jl Mega Kuningan Lot# 5.1
Kawasan Mega Kuningan
Jakarta 12950

Iran
ROHDE & SCHWARZ IRAN +98 21 8 73 02 82/8 73 54 78
Liaison Office - Reg. N° RFC 1947 +98 21 8 73 02 83
Dr. Beheschty Ave., Pakistan Ave., –
12th Street N° 1
Tehran 15317

Ireland
siehe/see Great Britain

Italy
ROHDE & SCHWARZ ITALIA S.p.a. +39 06 41 59 81
Via Tiburtina 1182 +39 06 41 59 82 70
I-00156 Roma –

Centro Direzionale Lombardo +39 02 95 70 41
Via Roma 108 +39 02 95 30 27 72
I-20060 Cassina de' Pecchi (MI)

Japan
ADVANTEST Corporation +81 3 39 30 40 30
RS Sales Department +81 3 39 30 41 86
1-32-1 Asahi-cho yoshimu@inst.advantest.co.jp
Nerima-ku
Tokyo 179

Kazakhstan
ROHDE & SCHWARZ GmbH & Co. KG +7 32 72 63 55 55
Representative Office Almaty +7 32 72 63 46 33
Pl. Respubliki 15 –
480091 Almaty

Korea
Hana Technica Corp. +82 2 5 14 45 46
Seoul Kangnam, P.O. Box 1458 +82 2 5 14 45 49
Young Dong Bldg. 4F hanateco@unitel.co.kr
63-16 Nonhyun-Dong, Kang Nam-Ku

Seoul

Kuwait
Zaid Al-Kazemi Sons Trading Co. +965 243 72 00
P.O. Box 30, Safat 13001 +965 240 15 62
Zaid Al-Kazemi Building adnan@ncc.moc.kw
Mubarak Al-Kabeer Street
Kuwait City

Lebanon
CONNECTIONS S.A.R.L. +961 1 42 48 25/6/7
Sami Solh Street +961 1 42 55 57
Cemate Building 201 – 2nd Fl TREZKALL@INCO.COM.LB
Sami El-Solh Street – Badaro
Beirut

Liechtenstein siehe/see Switzerland

Luxembourg siehe/see Belgium

Malaysia
DAGANG TEKNIK SDN. BHD. +60 3 7035503/7035568
No. 9, Jalan SS 4D/2 +60 3 7 03 34 39
Taman People´s Park danik@tm.net.my
47301 Petaling Jaya
Selangor Darul Ehsan

Malta
ITEC – International Technology Ltd. +35 6 37 43 00
B'Kara Road +35 6 37 43 53
San Gwann itec@keyworld.net

Mexico
Vertrieb Kommunikationstechnik/
Sales Communications Equipment:
ELECTROINGENIERIA de Precisión S.A. +52 5 5 59 76 77
EPSA S.A. +52 5 5 75 33 81
Uxmal 520, Colonia Vertiz Narvarte epsa@compuserve.com
03600 Mexico DF

Vertrieb Meßtechnik/Sales T & M Equipment:
Tektronix, S.A. de C.V. +525 666 63 33
Periférico Sur 5000, 8º Piso +525 666 63 36
Col. Insurgentes Cuicuilco
Coyoacán
04530 - Mexico, D.F.

Nepal
Abishek Trade Links (P) Ltd. +97 71 25 69 30
P.O.B. 9700 +97 71 24 25 73
Kathmandu Durbar@hotel.mos.com.np

Netherlands
ROHDE & SCHWARZ +31 30 6 00 17 00
NEDERLAND B.V. +31 30 6 00 17 99
Perkinsbaan 1 Rob.DenHartog/RSN%RSN@RSD.de
3439 ND Nieuwegein

New Zealand
Nichecom +64 4 2 32 32 33
Level 1 Tawa Plaza +64 4 2 32 32 30
210 Main Rd / P.O.B. 56-045 ISDN +64 4 2 37 30 10
Tawa, Wellington robin.hodgson@nichecom.co.nz

Nicaragua siehe/see Mexico

Norway
ROHDE & SCHWARZ NORGE +47 23 17 22 50
Østensjøveien 36, P.O.B. 103 BRYN +47 23 17 22 69
N-0611 Oslo –

Pakistan
TelcoNet Communications & +92 51 25 69 53
Engineering +92 51 51 86 27
213/D, Ordnance Road telecom@tnc.isb.erum.com.pk
Rawalpindi-Pakistan-46000

Panama siehe/see Mexico

Papua-New Guinea siehe/see Australia

Philippines
MARCOM Industrial Equipment, Inc. +632 8 13 29 31
MCC P.O.Box 2307 +632 8 17 05 07
6-L Mezzanine Suite, Vernida I
Condominium 120 Amorsolo St.
Legaspi Village
Makati City/Philippines 3117

Poland
ROHDE & SCHWARZ +48 22 8 60 64 90 bis 98
Oddzial w Polsce +48 22 8 60 64 99
ul. Stawki 2, Pietro 28 rspoland@rsoe
00-193 Warszawa

Portugal
TELERUS
Sistemas de Telecomunicações, S.A. +351 1 4 12 35 90
Rua General Ferreira Martins, Lote 6,2.ºB +351 1 4 12 36 00
P-1495 Algés telerus@mail.telepac.pt

Romania
ROHDE & SCHWARZ +40 1 4 10 68 46
Representation Office Bucharest +40 1 4 11 20 13
Uranus 98 sandu@rohde.eunet.ro
Bloc U8, Scara 2, Etaj 5, Ap. 36
RO-76102 Bucuresti

Russian Federation
ROHDE & SCHWARZ +7 095 2 34 49 62
Representative Office Moscow +7 095 2 34 49 63
1-j Kazacij per., 7 evg@rohde-schwarz.msk.ru
109017 Moscow

Saudi Arabia
Haji Abdullah Alireza & Co. Ltd. +966 1 4 65 44 78
P.O.B. 361 +966 1 4 65 07 82
Riyadh 11411 –
Kingdom of Saudi Arabia

Singapore
Vertrieb/Sales:
INFOTEL TECHNOLOGIES LTD. +65 2 87 68 22
19 Tai Seng Drive +65 2 84 95 55
Kinergy Building #06-00 general@infotel.com.sg
Singapore 535222

Support Centre Asia:
Rohde & Schwarz Support Centre
Asia Pvt. Ltd. +65 4 88 30 10
6th Floor, Singapore Technologies Building +65 2 87 30 61
19 Tai Seng Drive RSSCA@mbox4.singnet.com.g
535 222 Singapore

Slovak Republic
3S Specialne systemy a software, a.s. +421 7 72 24 88
Ilkovicova 3 +421 7 72 07 68
SK-81219 Bratislava 3s@internet.sk

Slovenia
ROHDE & SCHWARZ +3 86 61 1 23 46 51
Repräsentanz Ljubljana +3 86 61 1 23 46 11
Koprska 92
SI-61000 Ljubljana –

South Africa
S.A. Electro-Medical (Pty) Ltd. +27 12 8 04-16 20
115 Siersteen Road +27 12 8 04-20 09
Silvertondale mail@saem.co.za
P.O.B. 1784
Pretoria 0001

Spain
REMA Leo Haag S.A. +34 91 3 34 10 70
Salcedo, 11 +34 91 7 29 05 06
E-28034 Madrid rema@rema.es

Sri Lanka
LANKA AVIONICS +94 1 95 66 78
658/1/1, Negombo Road +94 1 95 83 11
Mattumagala –
Ragama

Adressen/Addresses

Sweden
ROHDE & SCHWARZ SVERIGE AB +46 8 6 05 19 00
Flygfältsgatan 15 +46 8 6 05 19 80
S-12830 Skarpnäck info@rss.se

Switzerland
Roschi Télécommunication AG +41 31 9 22 15 22
Papiermühlestrasse 145, Postfach +41 31 9 21 81 01
CH-3063 Ittigen

Syria
Electro Scientific Office +963 11 2 31 59 74
Baghdad Street +963 11 2 31 88 75
Dawara Clinical Lab. Building
P.O.B. 8162
Damascus

Taiwan
FUNCTION ENTERPRISE CO., LTD. +8 86 2 23 21 70 70
16F, No. 30, Pei-Ping East Road +8 86 2 23 95 87 82
Taipei, Taiwan R.O.C. hibiscus@function.linkease.com.tw

Thailand
Vertrieb Kommunikationstechnik/Sales Communications Equipment:
TPP Operations Co. Ltd. +662 4 48 51 59
70 MOO, 3 Mooban Mantana, +662 8 84 17 98
Soi Chimplee 4, Boromrajchonnee Rd.,
Talingchan, Bangkok 10170

Vertrieb Meßtechnik/Sales T & M Equipment:
Schmidt Scientific (Thailand) Ltd. +662 6 43 1330-9
Government Housing Bank Bldg. +662 6 43 1340-1
Tower II, 19th Floor, 212 Rama 9 Rd.,
Huaykwang, Bangkok 10320

Turkey
ROHDE & SCHWARZ +90 2 16 3 85 19 17
LIAISON OFFICE ISTANBUL +90 2 16 3 85 19 18
Bagdad Cad. 191/3, Ard. RSTURK@unimedya.net.tr
TR-81030 Selamicesme-Istanbul

Ukraine
ROHDE & SCHWARZ GmbH & CoKG +3 80 44 2 68 60 55
Representative Office Kiev +3 80 44 2 68 83 64
ul. Patrisa Lumumba, 4 rsbkiev@public.ua.net
UKR-252042 Kiev

United Arab Emirates
Service-Center für den Mittleren Osten/
Service Center for the Middle East:
ROHDE & SCHWARZ Emirates L.L.C. +9 71 2 31 20 40
P.O.B. 31156 +9 71 2 31 30 40
Abu Dhabi -

Vertrieb/Sales:
ROHDE & SCHWARZ +9 71 4 48 28 29
P.O.B. 53726 +9 71 4 48 27 94
Dubai

R&S BICK Mobile Communication
P.O.B. 17466 +9 71 4 81 36 75
JAFZ, LOB 04-028 +9 71 4 81 36 76
Dubai -

United Kingdom
ROHDE & SCHWARZ UK Ltd. +44 12 52 81 13 77
Ancells Business Park +44 12 52 81 14 47
Fleet, Hampshire GU 13 8UZ -

USA
Vertrieb Kommunikationstechnik/
Sales Communications Equipment:
ROHDE & SCHWARZ, Inc. +1 301 4 59 88 00
4425 Nicole Drive +1 301 4 59 28 10
Lanham, MD 20706 -

Vertrieb Meßtechnik/Sales T & M Equipment:
TEKTRONIX Inc. +1 800 835 9433 Ext. 6630
P.O.B. 500, M/S 50-216 +1 800 835 7732
Beaverton, OR 97076 -

Vietnam
Schmidt Vietnam Co., Ltd. +84 4 8 34 61 86
8/F, Schmidt Tower, Hanoi +84 4 8 34 61 88
Intern/ Technology Centre SVNHN@SCHMIDTGROUP.COM
Cau Giay, Tu Liem, IPO Box 89
Hanoi

Yugoslavia see/siehe Austria

Nicht aufgeführte Länder/Countries not listed:
ROHDE & SCHWARZ GmbH & Co. KG –
Division 5Z +49 89 41 29-36 62
Postfach 80 14 69 –
D-81614 München

Contents of Manuals for Universal Radio Communication Tester CMU

Operating Manual CMU-K27/-K28 (Software Options: TDMA (IS 136) 800/1900-MS for CMU-B21)

The present operating manual describes the application of the CMU for IS 136 mobile tests. It gives comprehensive information about the installation of the software, about manual as well as remote control of the instrument. Typical measurement tasks are explained in detail using the functions of the graphical user interface and a selection of program examples.

The manual is subdivided into the data sheet plus 8 chapters:

The data sheet	informs about guaranteed specifications and characteristics of IS 136 mobile measurements.
Chapter 1	describes the steps necessary for installing the software and putting the instrument into operation.
Chapter 2	gives an introduction to the application of the CMU for IS 136 mobile tests and presents some typical measurement examples.
Chapter 3	describes the operation in principle and the principles of measurement control.
Chapter 4	serves as a reference of all functions of the user interface and their application. Allowed settings, default values and the corresponding remote control commands are listed for all functions.
Chapter 5	describes the basics of remote control of the instrument for IS 136 mobile tests.
Chapter 6	lists all remote control commands defined for IS 136 mobile tests. At the end of the chapter the commands are grouped together according to their function and sorted in alphabetical order.
Chapter 10	contains an index for the operating manual.

Operating Manual CMU200

In the operating manual for CMU basic unit you will find everything that is needed to make yourself familiar with your Universal Radio Communication Tester CMU200. This includes information about the technical specifications of the CMU, the controls and connectors on the front and rear panel, necessary steps for putting the instrument into operation, the basic operating concept, manual and remote control. Typical measurement tasks are explained in detail using the functions of the user interface and program examples.

General concepts of CMU control are described in the operating manual CMU200 and not repeated in the manuals for the individual software options.

Operating Manual CMU-K29 (Software Options: AMPS-MS for CMU-B21)

The operating manual CMU-K29 describes the test of AMPS mobile phones by means of the CMU and the software options AMPS-MS for CMU-B21, order no. 1115.6807.02. The CMU-K29 operating manual is organized like the present TDMA (IS 136) manual.

Operating Manual CMU-K21/-K22/-K23 (Software Options: GSM900/1800/1900-MS for CMU-B21)

The operating manual CMU-K21/-K22/-K23 describes the test of GSM mobile phones by means of the CMU and the software options GSM900/1800/1900-MS for CMU-B21, order nos. 1115.6007.02/6107.02/6207.02. The CMU-K21/-K22/-K23 operating manual is organized like the present IS 136 manual.

Service Manual Instrument

The service manual informs on how to check compliance with rated specifications, on instrument function, repair, troubleshooting and fault elimination. It contains all information required for the maintenance of the CMU by exchanging modules.

Service Manual Modules

The service manual modules is not delivered with the instrument but may be obtained from your R&S service department with the order number 1100.4903.91.

Service manual modules contains information about the individual modules of the CMU. This comprises the test and adjustment of the modules, fault detection within the modules and the interface description.

Frequently Used Abbreviations

ACP	*Adjacent Channel Power*
Adj. Chan.	*Adjacent Channel*
AF	*Audio Frequency*
AMPS	*Advanced Mobile Phone System*
Att.	*Attenuation*
Avg.	*Average*
BER	*Bit Error Rate*
BS	*Base Station (=CMU)*
BSMC	*Base Station Manufacturer's Code*
Carr.	*Carrier*
Ch. / Chan.	*Channel*
Config.	*Configuration*
CW	*Continuous Wave*
DCC	*Digital Color Code*
DCCH	*Digital Control Channel*
Det.	*Detected*
DIC	*Delay Interval Compensation*
Disp.	*Display*
Dist.	*Distortion*
D-line	*Display line*
DMAC	*Digital Mobile Attenuation Code*
DQPSK	*Differential Quadrature Phase-Shift Keying*
DTC	*Digital Traffic Channel*
DTX	*Discontinuous Transmission*
DVCC	*Digital Voice Color Code*
DVCC	*Digital Verification Color Code*
EBCCH	*Extended Broadcast Control Channel*
ERP	*Effective Radiated Power*
ESN	*Electronic Serial Number*
EVM	*Error Vector Magnitude*
Ext. / Extern.	*External*
FBCCH	*Fast Broadcast Control Channel*
Freq.	*Frequency*
IF	*Intermediate Frequency*
IMSI	*International Mobile Subscriber Id. Number*
IS 136	*By IS 136 mobile phones we understand devices supporting the North American TDMA standard, specified in TIA/EIA-136.xxx (once IS-136) and related standards*
Lev.	*Level*
MAC	*Mobile Attenuation Code*
Magn.	*Magnitude*
MAHO	*Mobile-Assisted Handoff*
Max.	*Maximum*
MCC	*Mobile Country Code*
MIN	*Mobile Identification Number*
Min.	*Minimum*
MNC	*Mobile Network Code*
Mod.	*Modulation*
MPCI	*Mobile Protocol Capability Indicator*
MS	*Mobile Station*
MSID	*Mobile Station Identity*
MSIN	*Mobile Subscriber Id. No.*
Oversamp.	*Oversampling*
Ovw.	*Overview*
PFC	*Paging Frame Class*
PRBS	*Pseudo Random Bit Sequence*
Ref.	*Reference*
Reg.	*Registration*
Rel.	*Relative*
RF	*Radio Frequency*
RMS	*Root Mean Square (averaging)*
RSS	*Received Signal Strength*
RSSI	*Received Signal Strength Indication*
Short.	*Shortened*
SID	*System Identity*
SMS	*Short Message Service*
SN	*(Electronical) Serial Number*
SOC	*System Operator Code*
Src.	*Source*
STU	*Secure Terminal Unit*

Sync., Synch.	*Synchronization*
TDMA	*Time Division Multiple Access*
TMSI	*Temporary Mobile Station Identity*
tr.	*Transmitted*
Trg.	*Trigger*
TSC	*Training Sequence (Code), corresponding to synchronization pattern*
TX	*Transmitter*
Vect.	*Vector*

Contents

1 Installation **1.1**

Installing the Software **1.1**

Installation from a Set of Floppy Disks 1.1

Installation from a PCMCIA Card 1.2

1 Installation

This chapter describes the installation and update of the software options TDMA (IS 136) 800/1900-MS for the Universal Radio Communication Tester CMU.

Before proceeding to perform any of the steps described in this manual, please make sure that the instrument is properly connected and put into operation according to the instructions given in chapter 1 of the CMU200 manual. The hardware and software options available are shown in the *Startup* menu. The status of the software options required for TDMA mobile tests is indicated in the lines "CMU-K27 IS136 800-MS" and "CMU-K28 IS136 1900-MS". The option is ready to operate if its status is "available".

Installing the Software

The CMU is equipped with either a 3.5" floppy disk drive or a PCMCIA interface. It is controlled by a software tool, the VersionManager.

Installation from a Set of Floppy Disks

The installation kit for software option IS 136 800/1900-MS consists of a set of numbered floppy disks.

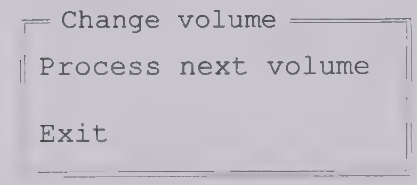
To install the software proceed as follows:

- Switch off the CMU.
- Insert the disk no. 1 into the floppy disk drive of your CMU.
- Switch on the CMU.

The installation is started automatically while the CMU performs its start-up procedure. To this end the VersionManager is called up.

- Use the cursor up/down keys to select the option *Install new software version.*

The installation is started. To indicate that the floppy disk must be changed the CMU issues the *Change volume* message:



```
Change volume
Process next volume

Exit
```

- Replace the current disk with the disk requested.
- Use the cursor up/down keys to elect “Process next volume” (default setting).
- Press *ENTER* to confirm that the new disk has been inserted and to continue the installation.

To monitor the installation process the CMU displays messages such as:

```
...Volume # 1 has been processed
...Volume # 2 to be installed next
```

After processing the last floppy disk the CMU displays the messages:

```
...Installation completed
...please remove the installation media to reboot
```

When the installation medium is removed the CMU reboots automatically and performs a firmware update of the hardware modules. This may take a few minutes. Afterwards the new software version is started and the instrument is ready to operate.

Installation from a PCMCIA Card

To be read by the CMU's card drive it must be copied to an appropriate storage medium (a flash disk or a PCMCIA hard disk).

The installation process is analogous to the installation from a set of floppy disks.

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Modulation Measurements 2.18

2 Getting Started

The following chapter presents a sample IS 136 mobile test with the universal radio communication tester CMU. It is intended to provide a quick overview of the function groups *IS 136 800/1900-MS Non Signalling* and *IS 136 800/1900-MS Signalling* and to lead through the most common tests which are performed on IS 136 mobile phones.

Before starting any measurement with the CMU, please note the instructions given in chapter 1 of the operating manual for the CMU basic unit for putting the instrument into operation. In chapters 2 to 4 of that manual you will also find information on customizing the instrument and the display according to your personal preferences. For installation instructions for the *IS 136 800/1900* software (CMU-K27/-K28) refer to chapter 1 of the present manual.

The tests reported below include

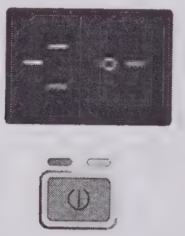
- Connection of the phone and selection of the IS 136 function group
- Basic settings in the *Non Signalling* mode
- Signalling parameters and call setup
- Power and modulation measurements in *Signalling* mode

The steps to perform are explained on the left side of each double-page together with the results obtained on the CMU screen. On the right side, additional information is given. We also point out alternative settings and related measurements which could not be reported in detail.

The principles of manual operation are discussed in chapter 3. For a systematic explanation of all menus, functions and parameters including IS 136 background information refer to the reference part in chapter 4.

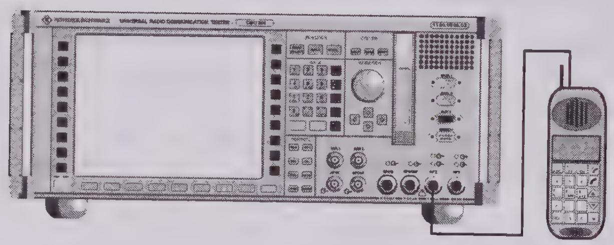
Preparing an IS 136 Mobile Phone Test

This chapter describes how to use the CMU for IS 136 mobile phone tests. As a prerequisite for starting the session, the instrument must be correctly set up and connected to the AC power supply as described in chapter 1 of the CMU200 operating manual. Furthermore, the IS 136 software must be properly installed following the instructions given in chapter 1 of the present manual.



Step 1

- ➢ Switch on the CMU using the mains switch at the rear. ①
- ➢ Check the operating mode of the instrument at the *ON/STANDBY* key on the front panel.②

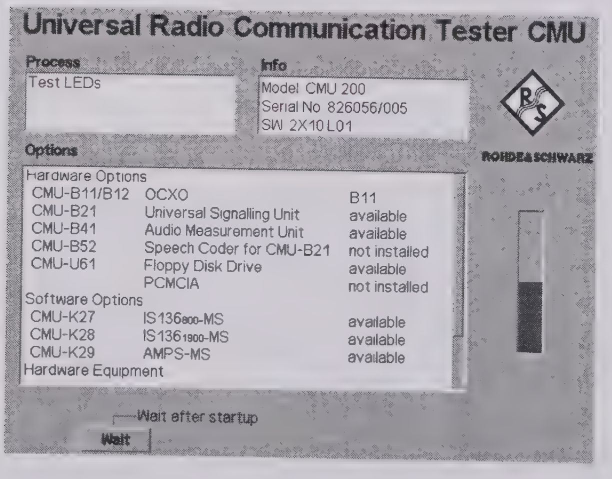


Step 2

- ➢ Connect the bi-directional RF connector RF 2 of the CMU to the antenna connector of the mobile phone. ③
- ➢ Make sure that the mobile phone is supplied with the correct operating voltage (battery or power supply).④

Step 3

- ➢ Switch on the CMU by pressing the *ON/STANDBY* key on the front panel.



Universal Radio Communication Tester CMU

Process

Test LEDs

Info

Model CMU 200
Serial No 826056/005
SW 2X10 L01

Options

Hardware Options

CMU-B11/B12	OCXO	B11
CMU-B21	Universal Signalling Unit	available
CMU-B41	Audio Measurement Unit	available
CMU-B52	Speech Coder for CMU-B21	not installed
CMU-U61	Floppy Disk Drive	available
	PCMCIA	not installed

Software Options

CMU-K27	IS 136$_{800}$-MS	available
CMU-K28	IS 136$_{1900}$-MS	available
CMU-K29	AMPS-MS	available

Hardware Equipment

The startup menu is displayed while the CMU performs a power-up test. ⑤

After a few seconds the CMU displays the last menu used in the previous session.

Additional Information...

... on Step 1

① **Mains switch on the rear panel**

When the mains switch at the rear is set to the OFF position, the complete instrument is disconnected from the power supply. When the mains switch is set to the ON position, the instrument is in standby mode or in operation, depending on the position of the power switch on the front panel.

② ***ON/STANDBY* key on the front panel**

The *ON/STANDBY* key at the front of the instrument determines whether the instrument is in standby mode or in operation.

Standby mode:
Only the reference frequency oscillator is supplied with operating voltage, and the yellow LED (STANDBY) is illuminated.

Operation:
The green LED (ON) is illuminated and all modules of the instrument are supplied with operating voltage.

... on Step 2

③ **RF connection of the mobile phone**

A high-quality cable should be used for this connection, ideally with an attenuation of less than 0.5 dB. For portable phones, the car installation set supplied by telephone manufacturers can be used.

④ **Power supply for the mobile phone**

In case the mobile phone is operated from an external power supply, make sure that it is capable of supplying the maximum peak current required. As IS 136 mobile phones generate bursted RF signals, they often feature a pulse-shaped current consumption. Problems may arise if power supplies are used which cannot provide such currents with a constant voltage.

Alternative Settings and Measurements

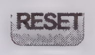
☞ chapter 1 of CMU manual

The CMU provides two bidirectional RF connectors RF1 and RF2 differing by their input and output level ranges. RF2 is the recommended standard connector for IS 136 mobile phones (handheld phones, see data sheet).

The unidirectional connectors RF4 IN and RF3 OUT are intended for connection of modules requiring high input levels or modules with low RF output levels. RF4 IN and RF3 OUT can also be used to connect IS 136 mobiles off the air via antennas.

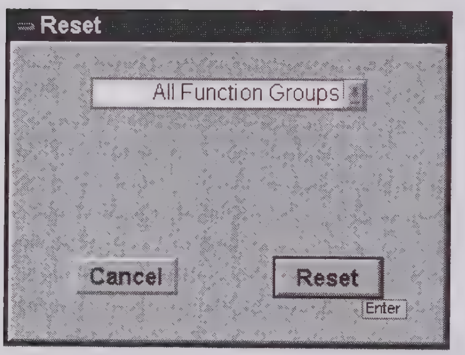
Input and output connectors can be selected in the ⊙→*/Ext./Att.* tab of the *Connect. Control* menu.

Step 3



- Press the *RESET* key.

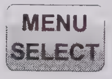
The *Reset* popup menu is opened.


Reset
All Function Groups
Cancel
Reset
Enter

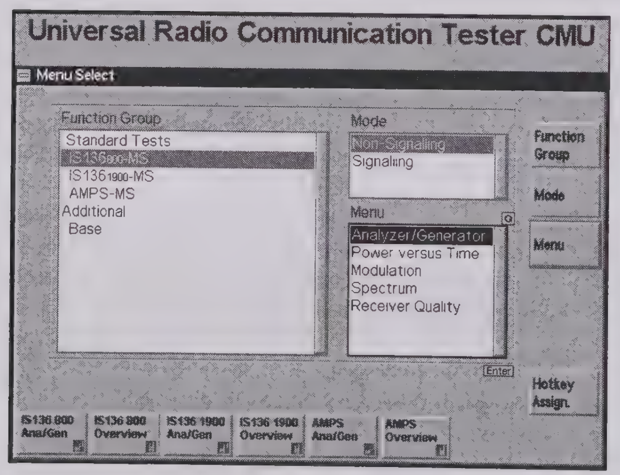
- Use the left and right arrow keys to toggle between the two buttons *Cancel* and *Reset*.
- Select *Reset* and press the *ENTER* key.
- In the popup window opened *(Are you sure?)*, select *Yes* to confirm the instrument reset.

The CMU indicates that it performs a general reset of all device settings and is then ready to carry out the following steps. The *Reset* popup menu is closed automatically.

Step 4


MENU
SELECT

- Press the *Menu Select* key to open the *Menu Select* menu.⑥


Universal Radio Communication Tester CMU
Menu Select
Function Group
Standard Tests
IS136800-MS
IS1361900-MS
AMPS-MS
Additional
Base
Mode
Non-Signalling
Signalling
Menu
Analyzer/Generator
Power versus Time
Modulation
Spectrum
Receiver Quality
Enter
Function Group
Mode
Menu
Hotkey Assign.
IS136 800 Ana/Gen
IS136 800 Overview
IS136 1900 Ana/Gen
IS136 1900 Overview
AMPS Ana/Gen
AMPS Overview

The *Menu Select* menu indicates the function groups available. If a function group is selected the corresponding modes and measurement menus are indicated.

- Select the IS 136 800-MS function group.
- Select the *Non Signalling* test mode.
- Select the *Analyzer/Generator* menu.
- Press the *Enter* key to activate the measurement selected and open the *Analyzer/Generator* menu.

Additional Information...

Alternative Settings and Measurements

... on Step 3

⑤ **Startup menu**

The startup menu displays the following information:

- The status of the startup test *(Process)*
- The device name, serial number and software version *(Info)*
- The options and equipment installed *(Options)*
- The progress of the startup test (*Startup* bar graph)

Before starting a measurement, a reset is recommended to set the instrument with all its functions into a definite state.

☞ chapter 4 of CMU manual

That chapter also contains information on customizing the CMU.

... on Step 4

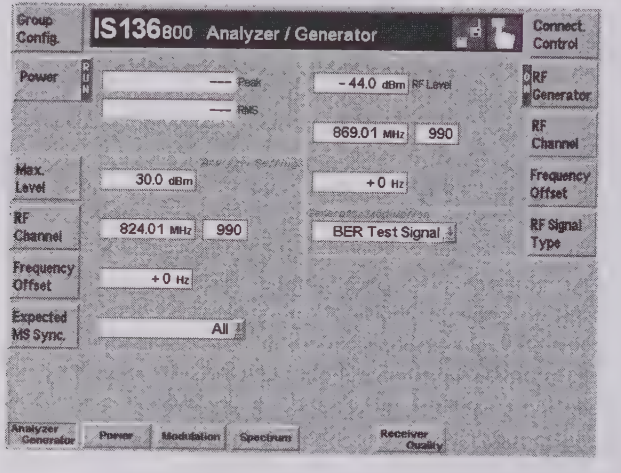
⑥ **Menu Select menu**

The *Menu Select* menu shows all function groups installed on your CMU. Function Group *IS 136 800/1900-MS* is subdivided in the two measurement modes *Non Signalling* and *Signalling*, each containing a number of measurement menus.

☞ chapter 3

Non Signalling Mode

In the *Non Signalling* mode, a specific RF signal can be generated and a RF signal with IS 136 characteristics analyzed. Compared to the *Signalling* mode test times may be reduced considerably. Moreover, the measurements are not restricted to the specified channel and MS output power ranges of the network.①


Group Config.
IS136 800 Analyzer / Generator
Connect. Control
Power
RF Generator
RF Channel
Frequency Offset
RF Signal Type
Max. Level
RF Channel
Frequency Offset
Expected MS Sync.
Analyzer Generator
Power
Modulation
Spectrum
Receiver Quality

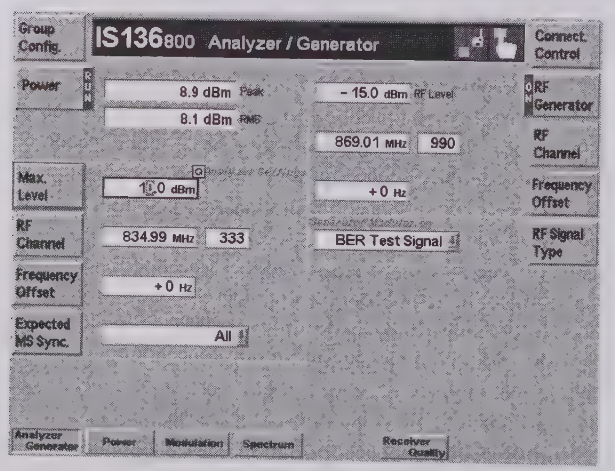
Power: --- Peak, --- RMS
RF Level: - 44.0 dBm
RF Channel: 869.01 MHz 990
Frequency Offset: + 0 Hz
RF Signal Type: BER Test Signal
Max. Level: 30.0 dBm
RF Channel: 824.01 MHz 990
Frequency Offset: + 0 Hz
Expected MS Sync.: All

Step 1

The *Analyzer/Generator* menu configures the signals generated by the RF generator of the CMU and sets the RF analyzer.②

At present, all parameters are set to default values. They can be changed directly in the *Analyzer/Generator* menu. User-defined parameters will be saved for later sessions when the CMU is switched off.

In addition, the current results for the peak and average burst power *(Peak* and *RMS)* of the received RF signal are displayed. The output fields show "---", indicating that no valid measurement results are available. ③


Group Config.
IS136 800 Analyzer / Generator
Connect. Control
Power
RF Generator
RF Channel
Frequency Offset
RF Signal Type
Max. Level
RF Channel
Frequency Offset
Expected MS Sync.
Analyzer Generator
Power
Modulation
Spectrum
Receiver Quality

Power: 8.9 dBm Peak, 8.1 dBm RMS
RF Level: - 15.0 dBm
RF Channel: 869.01 MHz 990
Frequency Offset: + 0 Hz
RF Signal Type: BER Test Signal
Max. Level: 10.0 dBm
RF Channel: 834.99 MHz 333
Frequency Offset: + 0 Hz
Expected MS Sync.: All

- ➢ Press the *Max. Level* softkey and adapt the maximum expected RF input level to the output power of the mobile. ④
- ➢ Press the *RF Chan.* softkey and set the RF channel equal to the traffic carrier channel of the mobile phone.

The peak and average burst power of the RF input signal is now indicated in the output fields associated to the *Power* softkey.

The other measurement menus of the *Non Signalling* test mode are accessible via the hotkeys across the bottom of the menu. They are largely identical in both test modes and will therefore be discussed in the *Signalling Mode* sections below.

MENU
SELECT

Step 4

- ➢ Press the *Menu Select* key to open the *Menu Select* menu again.
- ➢ Select the *Signalling* test mode.
- ➢ Select the *Overview* menu.
- ➢ Press the *Enter* key to activate the measurement selected.

Additional Information...

Non Signalling Mode

① Test mode of the mobile phone

To demonstrate the features of the *Non Signalling* mode, we use an IS-136 mobile phone that has been set to its "test mode". The settings and properties of the test mode depend on the mobile type.

... on Step 1

② Analyzer/Generator menu

In the right half, the *Analyzer/Generator* menu contains two configuration panels to configure the RF generator and to select a bit modulation sequence for the generated RF signal *(RF Signal Type)*.

The analyzer settings and measurement results are located in the left half of the menu.

The assignment between carrier frequency and channel number is according to IS 136 specifications. As the CMU simulates a base station, the generator signal corresponds to the forward path (signal direction from the base station towards the mobile station), the signal analyzed corresponds to the reverse path (signal direction from the mobile station towards the base station). The channel/frequency assignment changes accordingly.

The RF frequency can be set in multiples of 10 kHz. With an additional *Frequency Offset*, an RF signal with an arbitrary frequency that is in the range supported by the tester can be generated and analyzed.

③ Measurement and Generator State

The state indication of the different measurements and generators is included in the corresponding softkeys. For ongoing measurements, the results in the output fields are constantly updated.

For various reasons, an output field may fail to show a valid measurement result (indication "---"):

- The analyzer settings do not match the properties of the input signal.
- The input signal is missing.
- The measurement is switched off *(OFF* is indicated in the softkey controlling the measurement).

④ Max. Level

The *Max. Level* softkey sets the maximum RF input power which can be measured and is used to adjust the RF input path to the expected power of the measured signal. The permissible range *Max. Level* depends on the RF connector and the external attenuation used.

Alternative Settings and Measurements

The CMU *Non Signalling* mode is also suitable for module tests.

☞ chapter 4

To facilitate and speed up the operation, many CMU settings are accessible from different menus. The RF generator and analyzer settings are also part of the *Signal tab* in the Connect. Control menu.

Selecting a definite *RF Signal Type* implies that a signal with definite characteristics is generated.

On the other hand, selecting a definite synchronization pattern in the *Analyzer Settings panel (Expected MS Sync.* softkey) implies that only signals with this sync. pattern are analyzed.

The current options for the measurement state are *RUN* (default) and *OFF*. A third state, *HLT*, occurs after a single-shot measurement is terminated (see p. 2.13).

Once selected, the *TX Tests – Modulation* measurement can be switched off and on by means of the toggle key *ON/OFF*.

Generators may also be switched on (state *ON)* and off (state *OFF)* by means of the *ON/OFF* key.

☞ Chapter 4

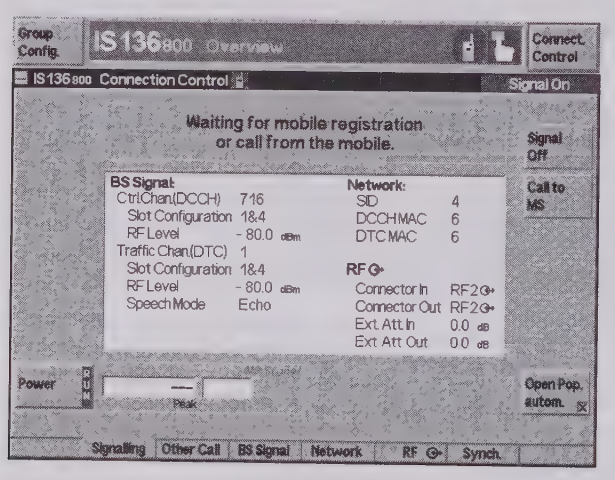
The RF *Max. Level* can also be set in the *Group Config.* menu.

Signalling Mode

In the *Signalling* mode the CMU first transmits a control channel signal to which the mobile is able to synchronize. A call can then be established from either the CMU or the mobile. The measurement must be triggered by the signal transmitted by the mobile or by the CMU signalling unit; an external trigger signal can not be used.

Call Setup and Signalling Parameters

The signalling process is controlled via the *Connection Control* popup menu. The first of four *Signalling* tabs contained in the *Connection Control* popup menu is automatically displayed when the *Signalling* Mode is selected (see *Menu Select* menu on page 2.4, for the following examples, *IS-136 800-MS Signalling Meas*. with the *Overwiew* menu was selected).


Group Config.
IS 136 800 Overview
Connect. Control
IS 136 800 Connection Control
Signal On
Signal Off
Call to MS
Power
Peak
Open Pop. autom.
Signalling
Other Call
BS Signal
Network
RF
Synch.

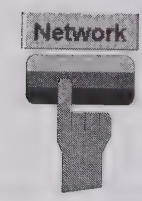
Waiting for mobile registration or call from the mobile.

```
BS Signal:                                Network:
 Ctrl.Chan.(DCCH)     716                  SID             4
  Slot Configuration  1&4                  DCCH MAC        6
  RF Level            - 80.0 dBm           DTC MAC         6
 Traffic Chan.(DTC)   1
  Slot Configuration  1&4                 RF
  RF Level            - 80.0 dBm           Connector In    RF2
  Speech Mode         Echo                 Connector Out   RF2
                                           Ext. Att. In    0.0 dB
                                           Ext. Att Out    0.0 dB
```

Step 1

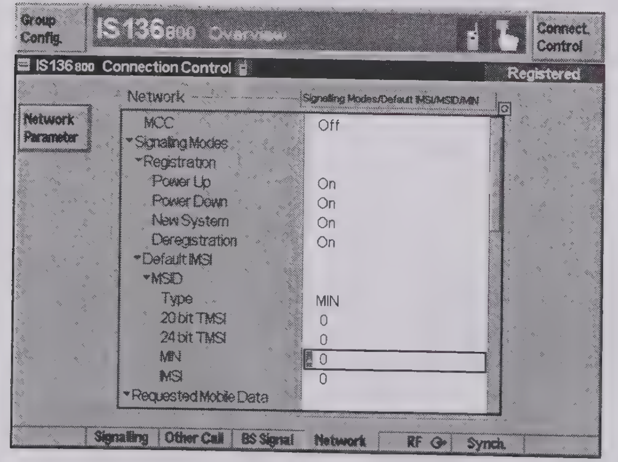
The *Signalling (Signal On)* tab indicates the parameters characterizing the signals generated by the CMU *(BS Signal)*.① In addition the system identity, the mobile attenuation codes, and the characteristics of the input and output connectors are shown.②

Below the list, the *Power* softkey shows the current status of the wide-band power measurement for RF input signals, the current measured peak power and its ratio to the effective radiated power of the mobile.③



Step 2

- ➢ Press the *Network* hotkey.


Group Config.
IS 136 800 Overview
Connect. Control
IS 136 800 Connection Control
Registered
Network Parameter
Network
Signaling Modes/Default IMSI/MSID/MIN
Signalling
Other Call
BS Signal
Network
RF
Synch.

```
 MCC                      Off
▾Signaling Modes
 ▾Registration
   Power Up               On
   Power Down             On
   New System             On
   Deregistration         On
 ▾Default IMSI
  ▾MSID
    Type                  MIN
    20 bit TMSI           0
    24 bit TMSI           0
    MIN                   0
    IMSI                  0
▾Requested Mobile Data
```

The *Network* tab is displayed. ④

- ➢ Press the *ON/OFF* key to expand the menu tables.
- ➢ Select the *MSID* field and enter the identifiy of your mobile phone.

Additional Information...

Alternative Settings and Measurements

... on Step 1

① BS Signal

The CMU is able to generate two different RF carrier signals (traffic channel and control channel) which can be configured separately. This allows a complete simulation of what happens in a real IS 136 network.

☞ chapter 4.

The control and traffic channels are configured in the *Network* tab of the Connection Control menu. To access this tab press the associated hotkey.

② Network Identity, ⊖/Ext.Att.

The network is identified by the code numbers SID (System Identity) and MCC (Mobile Country Code). These codes are transmitted to the mobile station on the control channel. The CMU uses the default SID shown in the diagram on the left side.

Input/output connectors suitable for the type of measurements and signal levels must be chosen – see section *RF connection* on page 2.3. An external input/output attenuation value can be specified in order to compensate for known attenuations of the input/output signal like those caused by cables.

☞ chapter 4.

The network identity and other parameters characterizing the network are configured in the *Network* tab of the Connection Control menu. To access this tab press the associated hotkey (see below).

Input/output connectors and external attenuations are configured in the *RF* ⊖ tab.

③ Input level

The softkey *Power* has no configuration menu assigned but can be used like any other softkey controlling a measurement. In particular, it is used to switch over between the measurement states *RUN* and *OFF* (softkey selection plus *ON/OFF* key) and *RUN/HLT* (softkey selection plus *CONT/HALT* key).

☞ CMU manual chapter 3.

See also the diagrams on measurement control in chapter 5 of the present manual.

... on Step 2

④ Network parameters

The *Network* tab defines a variety of parameters related to the network and the operating mode of the mobile station.

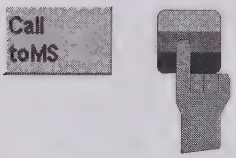
The purpose of these settings is to simulate the operating conditions of a mobile station in the IS 136 network as realistically as possible. Many of the settings have an impact on the speed of the *Signalling* measurements.

As a prerequisite for setting up a call from the tester, the MSID (Mobile Station Identity) of the mobile phone under test must be known. Depending on the mobile type, the MSID can be either a 20 or 24-bit TMSI, a 34-bit MIN, or a 50-bit IMSI.

☞ Chapter 4.

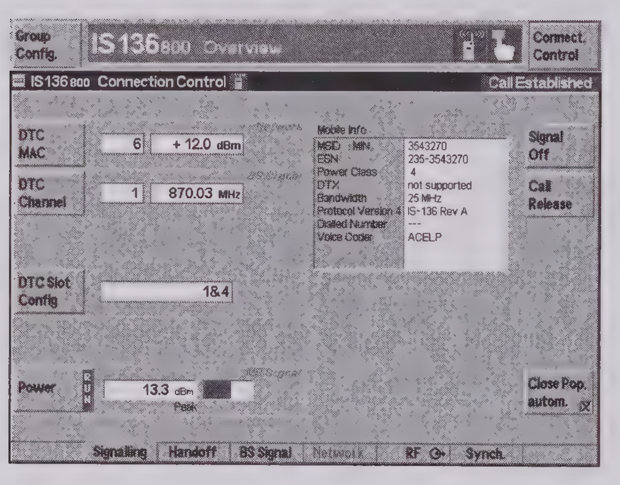
If the MSID is not reported to the CMU, it is unable to set up a call. However, a registration or a call can be initiated from the mobile station. After first registration, or after a call has been established for the first time, the MIN is transferred to the tester and is available for future calls. MS registration can also be enabled or disabled in the *Network* tab.

Step 3



➢ Press the *Call to MS* softkey.

The header message *Paging in progress* is displayed. When the mobile starts ringing, the *Signalling (Alerting)* tab is displayed.


Group Config.
IS136800 Overview
Connect. Control
IS136800 Connection Control
Call Established
DTC MAC
DTC Channel
DTC Slot Config
Power
RUN
Network
BS Signal
MS Signal
Mobile Info
Signal Off
Call Release
Close Pop. autom.
Signalling
Handoff
BS Signal
Network
RF
Synch.

DTC MAC: 6 | + 12.0 dBm

DTC Channel: 1 | 870.03 MHz

DTC Slot Config: 1&4

Power: 13.3 dBm Peak

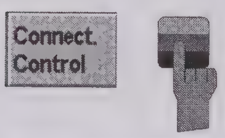
Mobile Info	
MSID : MIN	3543270
ESN	235-3543270
Power Class	4
DTX	not supported
Bandwidth	25 MHz
Protocol Version 4	IS-136 Rev A
Dialled Number	---
Voice Coder	ACELP

As soon as the mobile is picked up, the *Signalling (Call Established)* tab is displayed (this tab is closed automatically after a short while but can be reopened by pressing the *Connect. Control* softkey).

The *Signalling (Call Established)* tab presents a comprehensive list of the signalling parameters (see *Mobile Info* on page 2.11).

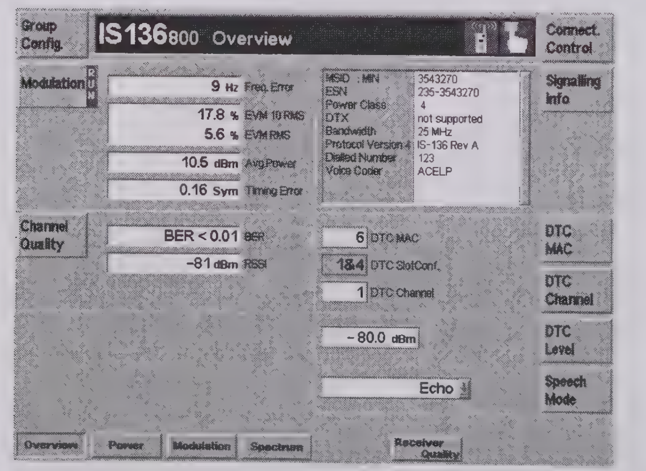
Besides the mobile attenuation code *(DTC MAC)* ⑤, the parameters of the traffic channel signals transmitted by the CMU *(BS Signal)* ⑥ can be configured.

Step 4


Connect.
Control

➢ Press the *Connect. Control* softkey or the *ESCAPE* key.

The *Connect. Control* menu is closed; the CMU displays the *Overview* menu.


Group Config.
IS136800 Overview
Connect. Control
Modulation
RUN
Channel Quality
Signalling Info
DTC MAC
DTC Channel
DTC Level
Speech Mode
Overview
Power
Modulation
Spectrum
Receiver Quality

9 Hz Freq. Error

17.8 % EVM 10 RMS

5.6 % EVM RMS

10.5 dBm Avg.Power

0.16 Sym Timing Error

BER < 0.01 BER

–81 dBm RSSI

MSID : MIN	3543270
ESN	235-3543270
Power Class	4
DTX	not supported
Bandwidth	25 MHz
Protocol Version 4	IS-136 Rev A
Dialled Number	123
Voice Coder	ACELP

6 DTC MAC

1&4 DTC SlotConf.

1 DTC Channel

– 80.0 dBm

Echo

The *Overview* menu indicates the most important settings in the function group *IS 136-MS Signalling* and the main results of the *Modulation* and the *Receiver Quality* (softkey *Channel Quality)* measurements. Moreover the signalling info from the mobile station is displayed. ⑦

Additional Information...

Alternative Settings and Measurements

... on Step 3

⑤ Mobile Attenuation Code (MAC)

Dynamic power control is used in IS 136 networks to reduce the output power of the mobile station as far as possible: In practice the mobile station is set to one of eleven Mobile Attenuation Codes *(MAC)* ranging from 0 to 10, where MAC equal to 0 corresponds to the largest nominal output power.

The *power class* characterizes the nominal maximum output power of the mobile. The Effective Radiated Power (ERP) of the mobile is a function of both its MAC and its power class.

The MAC can be used to control the maximum expected RF input level at the CMU and to vary the RF input power for the individual measurements.

☞ Chapter 4.

MAC levels and power classes are listed in section *Overview of the Function Group* in chapter 4.

⑥ Traffic channel

The channel number of the BS traffic channel signal is defined according to IS 136 specifications as explained for the *Non Signalling* mode (forward path, see *Analyzer/Generator menu* on page 2.7).

☞ Chapter 4.

MAC, Traffic Channel and Trigger

The MAC of the mobile station and the traffic channel number can be changed in all measurement groups while a call is established. This is in contrast to the *Non Signalling* mode where no settings concerning the device under test can be made.

Finally the two test modes differ in the trigger settings available: In the *Non Signalling* mode an external trigger signal can be used whereas in *Signalling* mode, the measurements must be triggered either by the input signal or by the CMU signalling unit.

☞ Chapter 4.

... on Step 4

⑦ Mobile Info

The *Mobile Info* list shows the basic properties of the connected mobile station. Note that the values shown are no default values (like the *Default MSID* set in the *Network* tab) but represent the information provided by the mobile station and transferred to the CMU. The parameters are therefore available in the *Call Established* and *Registered* signalling states only.

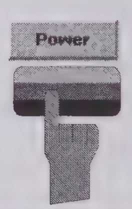
☞ Chapter 4.

For a comprehensive overview of signalling states and possible transitions refer to the figure at the beginning of section *IS 136 Mobile Tests*.

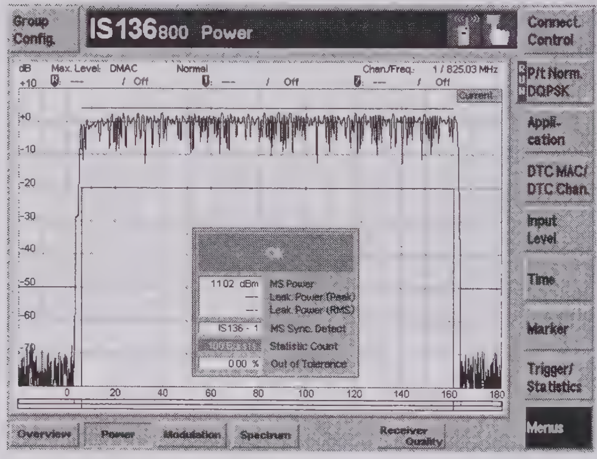
Power Measurements

As described above, all measurement menus in *IS 136 800-MS Signalling* mode can be called up from the *Menu Select* menu. Once a measurement menu is opened, the hotkeys can be used to switch over to any of the other measurements.

Step 1



- Press the *Power* hotkey to switch over to the graphical measurement menu *Power*.


Group Config.
IS136800 Power
Connect. Control
P/t Norm. DQPSK
Appli-cation
DTC MAC/ DTC Chan.
Input Level
Time
Marker
Trigger/ Statistics
Menus
Overview
Power
Modulation
Spectrum
Receiver Quality
Current
dB
+10
+0
-10
-20
-30
-40
-50
-60
-70
0
20
40
60
80
100
120
140
160
180

Max. Level: DMAC Normal Chan./Freq.: 1 / 825.03 MHz

--- / Off --- / Off --- / Off

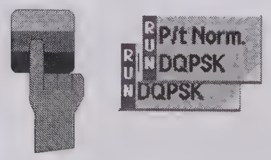
1102 dBm	MS Power
---	Leak. Power (Peak)
---	Leak. Power (RMS)
IS136 - 1	MS Sync. Detect
[illegible]	Statistic Count
0.00 %	Out of Tolerance

The *Power* menu shows the power of the current burst as a function of time. ①

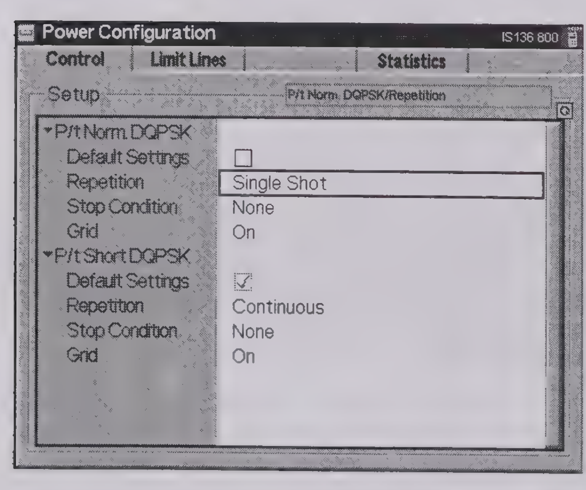
Together with the burst power, a tolerance template as specified in the standard is displayed. Settings (at present, the default settings) and scalar results are displayed in two parameter lines above the diagram and in a message box positioned in the center of the diagram.

Various tools allowing to take a closer look at the measurement results are provided in the graphical measurement menu.

Step 2


P/t Norm. DQPSK
DQPSK

- Select (press) the *P/t Norm. DQPSK* softkey.
- Press the selected *P/t Norm. DQPSK* softkey again to call up the *Power Configuration* menu.


Power Configuration
IS136 800
Control
Limit Lines
Statistics

Setup: P/t Norm. DQPSK/Repetition

- P/t Norm. DQPSK
  - Default Settings ☐
  - Repetition: Single Shot
  - Stop Condition: None
  - Grid: On
- P/t Short DQPSK
  - Default Settings ☑
  - Repetition: Continuous
  - Stop Condition: None
  - Grid: On

The *Power Configuration* menu defines the scope of the *Power* measurement. To pick just one example of the settings, we limit the number of bursts measured.②

- Press the *ON/OFF* key to expand the menu tables.
- Select *Single Shot* in the *Repetition* table line of the *P/t Norm. DQPSK* section.③
- Press the *ESCAPE* key to close the *Power Configuration* menu and return to the main menu.

The Power measurement is stopped after one statistics cycle. The status indication next to the *Power* softkey is set to *HLT*.④

Additional Information...

Alternative Settings and Measurements

... on Step 1

① **Power menu**

The diagram in the *Power* menu shows a normal burst with a length of 162 symbols (application *P/t Norm. DQPSK*; shortened bursts, which are 20 symbols shorter, can be measured in the *P/t Short. DQPSK* application). The time scale of the diagram ranges from –20 symbols to 181 symbols covering the useful part, the rising and falling edges plus a time margin before and after the burst. The ordinate ranges from –80 dB to +10 dB, the 0-dB reference level is equal to the carrier power.

☞ chapter 4.

The reference level can be modified in the *Group Config.* menu or by means of the *Input Level* softkey.

... on Step 2

② **Power Configuration menu**

The *Power Configuration* menu contains three tabs defining

- The repetition mode and stop condition *(Control)*
- The limit lines *(Limit Lines)*
- The display mode and statistic count *(Statistics)* of the power ramp measurement

☞ chapter 3.

Settings made in the *Power Configuration* menu apply to power measurements only.

Settings made in *the Group Config.* and *Connect. Control* menus apply to the entire function group *IS 136 800/1900*.

③ **Repetition mode and Stop Condition**

If no stop condition is imposed *(Stop Condition = None),* the *Repetition* mode determines whether the measurement is

- Continued until explicitly stopped by the operator *(Continuous)*
- Stopped after one statistic count *(Single Shot)*

By default, a statistic count comprises 100 bursts. With *Stop Condition = On Limit Failure*, the measurement is stopped after the first burst which is out of tolerance.

☞ chapter 3.

The *statistic count* is defined in the *Statistics* tab of the *Power Configuration* menu.

The stop condition *On Limit Failure* should be selected if the limit check represents the main purpose of the measurement.

The limits can be modified in the Limit Lines tab of the *Power Configuration* menu.

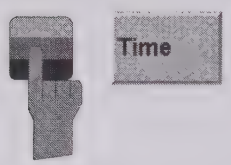
④ **Measurement in the HLT state**

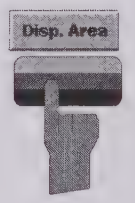
The average and peak power of the last burst measured is indicated in the output fields *Average* and *Peak*.

In contrast, the modulation measurement is still running. The results for the frequency and phase errors are periodically updated.

☞ CMU200 manual

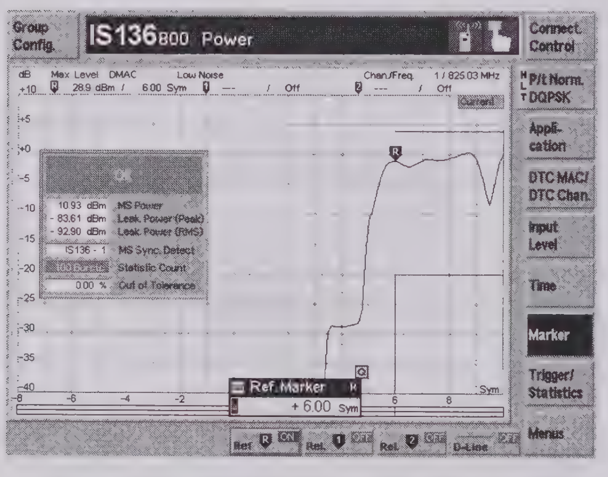
See the sections on measurement control in chapter 3 and 5.





Step 4

- ➢ Press the *Time* softkey to change the hotkeys displayed below the diagram.①
- ➢ Press the *Disp. Area* hotkey to open a window offering a list of different zoom areas.


Group Config.
IS136 800 Power
Connect. Control
P/t Norm. DQPSK
Appli- cation
DTC MAC/ DTC Chan.
Input Level
Time
Marker
Trigger/ Statistics
Menus
Ref. Marker
Ref
Rel.
Rel.
D-Line
ON
Off
Off
Off
Current
dB
+10
+5
+0
-5
-10
-15
-20
-25
-30
-35
-40
-8
-6
-4
-2
6
8
Sym

Max Level DMAC Low Noise Chan./Freq. 1 / 825.03 MHz

R 28.9 dBm / 6.00 Sym 1 --- / Off 2 --- / Off

10.93 dBm MS Power
- 83.61 dBm Leak. Power (Peak)
- 92.90 dBm Leak. Power (RMS)
IS136 - 1 MS Sync. Detect
Statistic Count
0.00 % Out of Tolerance

Ref. Marker + 6.00 Sym

If you select *Left Upper Corner* the CMU zooms in on the left upper corner of the burst.

- ➢ Press the *Marker* softkey and the *Ref R* hotkey. Enter an abscissa value (in bits) to position a reference marker onto the trace.②

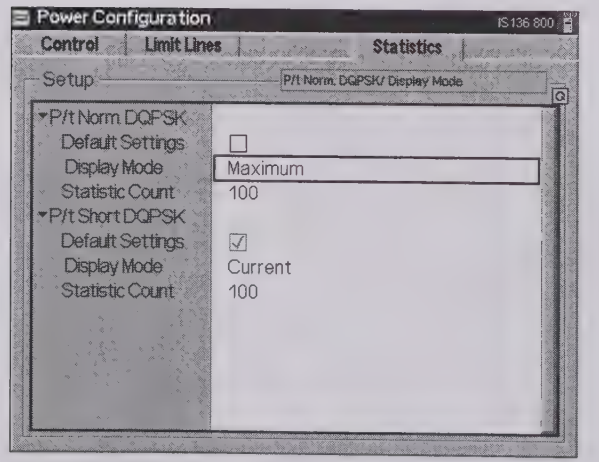
The coordinates (time and burst power) of the reference marker are displayed in the second parameter line.

For the next step we'll take advantage of the fact that the configuration menu is accessible from the graphical menu as well.

P/t Norm.
DQPSK
DQPSK
RUN
RUN

Step 5

- ➢ Press the *P/t Norm. DQPSK* softkey twice to reopen the *Power Configuration* menu.


Power Configuration
IS 136 800
Control
Limit Lines
Statistics
Setup

P/t Norm. DQPSK/ Display Mode

- P/t Norm DQPSK
  - Default Settings ☐
  - Display Mode Maximum
  - Statistic Count 100
- P/t Short DQPSK
  - Default Settings ☑
  - Display Mode Current
  - Statistic Count 100

- ➢ Select the *Control* tab.
- ➢ Select *Continuous* from the *Repetition* group of toggle switches to restart the measurement.
- ➢ Select the *Statistics* tab.
- ➢ From the *Display Mode* field, select *Maximum*.③

Instead of the current burst power, the maximum burst power ever measured at each point in time is shown in the diagram. As no stop condition is set, the measurement will be running until explicitly terminated.

Additional Information...

... on Step 4

① Softkeys and hotkeys

To enlarge the diagram area of the graphical measurement menus the left softkey column is suppressed. The functionality of each softkey on the right side is extended by hotkeys assigned to the softkeys. These hotkeys are displayed across the hotkey bar below the diagram when the softkey is selected.

Some of the softkey/hotkey combinations offer settings that can be also accessed via configuration menus. For example, the settings offered by the *Input Level* softkey are equivalent to the *Input Level* tab in the *Group Configuration* menu. Identical settings overwrite each other; the last value entered is valid for the whole function group.

② Markers

Markers are a graphical tool used to locate points on a trace and read out their coordinates. A reference marker and two delta markers may be defined in the *Power* menu.

The reference marker R measures the absolute level of the trace, the delta markers 1 and 2 measure the distance between their position and the reference marker.

... on Step 5

③ Display mode

If the measurement extends over several bursts the CMU calculates four different traces one of which can be selected in the *Display Mode* panel. The purpose of the four traces is to give an overview of the range and arithmetic mean value of the levels detected at any point on the time axis. The following traces can be displayed:

Current	the current burst level
Maximum	the maximum of all burst levels measured
Minimum	the minimum of all burst levels measured
Average	the average of all burst levels measured in the last statistic count.

The *Statistic Count* input field defines how many evaluation periods form a statistics cycle. For IS 136 *Non Signalling* measurements an evaluation period is equal to the propagation time of a normal burst (this definition holds even if a continuous carrier signal is transmitted). In our example the statistics cycle comprises 100 Bursts (default value).

Alternative Settings and Measurements

☞ chapter 4.

The *Application* softkey switches between the applications of the Power measurement.

The *DTC MAC/DTC Chan.* softkey determines the frequency and channel of the measured signal.

The *Input Level* softkey configures the input level and external attenuation.

The *Time* softkey defines the time axis and the zoom area.

The *Marker* softkey sets markers and D-lines.

The *Trigger/Statistics* softkey sets the trigger condition and the display mode.

☞ chapter 4.

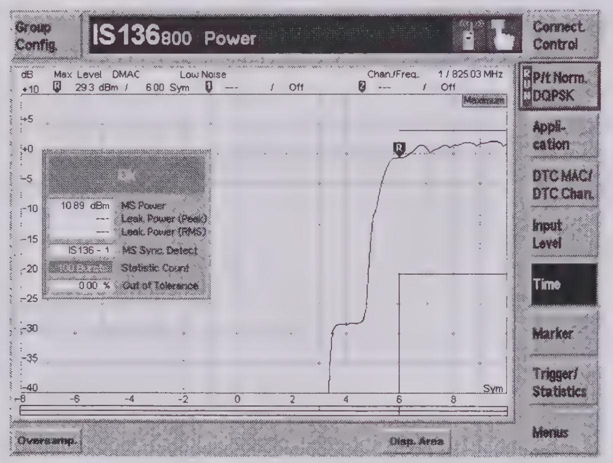
In addition to markers, a D-line can be used to measure a particular level in the diagram.

☞ chapter 3.

To refine the statistical evaluation, a suitable combination of the statistic count, repetition mode, stop condition and display mode should be selected.

Step 6

- Press the ESCAPE key to close the *Power Configuration* menu and return to the main menu.


Group Config.
IS136800 Power
Connect. Control
P/t Norm. DQPSK
Appli-cation
DTC MAC/ DTC Chan.
Input Level
Time
Marker
Trigger/ Statistics
Menus
Oversamp.
Disp. Area
Maximum
dB
+10
+5
+0
-5
-10
-15
-20
-25
-30
-35
-40
-8
-6
-4
-2
0
2
4
6
8
Sym

Max Level 29.3 dBm / DMAC 6.00 Sym / Low Noise --- / Off / Chan./Freq. 1 / 825.03 MHz --- / Off

10.89 dBm MS Power
--- Leak. Power (Peak)
--- Leak. Power (RMS)
IS136 - 1 MS Sync. Detect
Statistic Count
0.00 % Out of Tolerance

The trace is now continuously measured and updated in the display. With the display mode *Maximum*, trace values will be replaced only if a current measured value at a particular test point exceeds all values measured previously.

Additional Information...

Out-of-tolerance power measurements

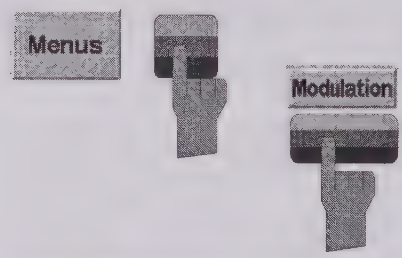
If a power measurement is out of tolerance, please ensure that the attenuation of any cables and/or antenna couplers used is being taken into account by the CMU. As most IS 136 power levels must be within +2 dB/–4 dB of the nominal value given in the specifications, even a small attenuation can result in an out-of-tolerance measurement.

External attenuation values for each input/output may be entered in the *RF* ↔ tab of the *Connect. Control* menu

The cables, RF connections and antenna couplers must also be in good condition for satisfactory measurements. Dirty or broken RF connections can cause problems at the high frequencies used by IS 136 networks.

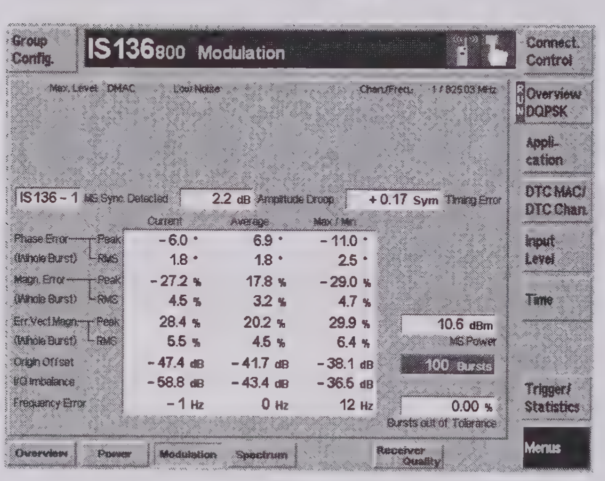
Modulation Measurements

To switch over to the *Modulation* measurement, we use again the hotkey bar.


Menus
Modulation

Step 1

- ➢ Press the *Menus* softkey to display the measurement groups available in the hotkey bar.
- ➢ Press the *Modulation* hotkey to open the *Modulation* menu.


Group Config.
IS136800 Modulation
Connect. Control
Overview DQPSK
Appli-cation
DTC MAC/ DTC Chan.
Input Level
Time
Trigger/ Statistics
Menus
Overview
Power
Modulation
Spectrum
Receiver Quality

Max. Level: DMAC Low Noise Chan./Freq.: 1 / 825.03 MHz

IS136 - 1 MS Sync. Detected 2.2 dB Amplitude Droop + 0.17 Sym Timing Error

		Current	Average	Max / Min
Phase Error (Whole Burst)	Peak	- 6.0 °	6.9 °	- 11.0 °
	RMS	1.8 °	1.8 °	2.5 °
Magn. Error (Whole Burst)	Peak	- 27.2 %	17.8 %	- 29.0 %
	RMS	4.5 %	3.2 %	4.7 %
Err.Vect.Magn. (Whole Burst)	Peak	28.4 %	20.2 %	29.9 %
	RMS	5.5 %	4.5 %	6.4 %
Origin Offset		- 47.4 dB	- 41.7 dB	- 38.1 dB
I/Q Imbalance		- 58.8 dB	- 43.4 dB	- 36.5 dB
Frequency Error		- 1 Hz	0 Hz	12 Hz

10.6 dBm MS Power

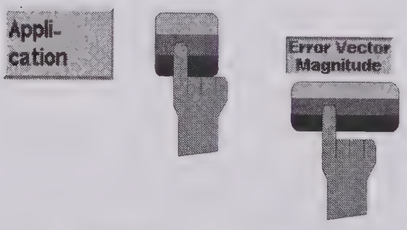
100 Bursts

0.00 % Bursts out of Tolerance

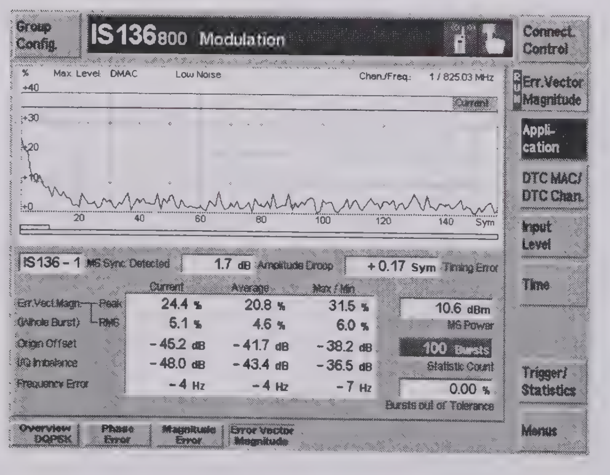
The *Modulation – Overview* menu displays the main results of the Modulation measurement.①

If a result exceeds the tolerances, the corresponding output field is red, and an arrow pointing upwards/downwards indicates that the result is above/below the limit.

Step 2


Appli-cation
Error Vector Magnitude

- ➢ Press the *Application* softkey to display the different applications within the *Modulation* menu.②
- ➢ Press the *Error Vector Magnitude* hotkey to switch over to the *Error Vector Magnitude* application.


Group Config.
IS136800 Modulation
Connect. Control
Err.Vector Magnitude
Appli-cation
DTC MAC/ DTC Chan.
Input Level
Time
Trigger/ Statistics
Menus
Overview DQPSK
Phase Error
Magnitude Error
Error Vector Magnitude
%
+40
+30
+20
+10
+0
Current
20
40
60
80
100
120
140
Sym

Max. Level: DMAC Low Noise Chan./Freq.: 1 / 825.03 MHz

IS136 - 1 MS Sync. Detected 1.7 dB Amplitude Droop + 0.17 Sym Timing Error

		Current	Average	Max / Min
Err.Vect.Magn. (Whole Burst)	Peak	24.4 %	20.8 %	31.5 %
	RMS	5.1 %	4.6 %	6.0 %
Origin Offset		- 45.2 dB	- 41.7 dB	- 38.2 dB
I/Q Imbalance		- 48.0 dB	- 43.4 dB	- 36.5 dB
Frequency Error		- 4 Hz	- 4 Hz	- 7 Hz

10.6 dBm MS Power

100 Bursts Statistic Count

0.00 % Bursts out of Tolerance

The *Modulation – Error Vector Magnitude* menu displays the Error Vector Magnitude of the current burst as a function of time.③

The output fields below correspond to the ones shown in the Overview application.

The remaining measurement menus can be operated in analogy to the *Power* and *Modulation* measurement described so far. For an introduction to each measurement group refer to chapter 4 of this manual.

Additional Information...

.... on Step 1

① **Statistical quantities**

The table in the *Overview* menu reports peak and RMS-averaged values of quantities characterizing the errors of the modulation vector. In addition, the scalar modulation results *Origin Offset, I/Q Imbalance,* and *Frequency Error* are indicated. The values in the three columns of the table are calculated as follows:

- The *Current* column contains the results for the current burst.
- The *Average* column contains the currents results averaged over the last statistics cycle.
- The *Max./Min.* column contains the extreme values of the current results for all bursts measured.

... on Step 2

② **Applications**

Applications are different measurements belonging to the same measurement group. Each application is assigned its own set of configuration parameters. Therefore, the applications of a measurement group can be configured individually and serviced in parallel.

The *Modulation* menu comprises the four applications *Overview, Phase Error, Magnitude Error, and Error Vector Magnitude.*

③ **Measured values and limits**

The limits may be modified in the *Limits* tab of the *Modulation Configuration* Menu which is opened by pressing the *Overview DQPSK* softkey twice. The *Modulation Configuration* menu is analogous to the *Power Ramp Configuration* menu explained on the previous pages. According to the requirements of the measurements the two configuration menus differ in two respects:

- Errors of the modulation vector (i.e. the phase errors, magnitude errors, and the error vector magnitude) are relevant within the useful part of the burst. Therefore, fixed limits are specified. It is not necessary to discriminate between different areas of the burst (see item ② below).
- The absolute value of the phase error is a measure of the quality of modulation, whereas the sign is of secondary interest. This is why the display modes *Minimum* and *Maximum* can not be selected separately, the CMU displays the extreme values instead (display mode *Minimum/Maximum*).

Alternative Settings and Measurements

☞ chapter 3.

The averaging prescription for the different results in the table is explained in detail in chapter 3 and in chapter 4, section *Modulation Measurements – Measurement Results.*

☞ Chapter 5 of CMU200 manual

Another set of applications is provided in the *RX Tests* menu.

☞ chapter 4.

The principle of *Modulation* measurements and the measured quantities are explained at the beginning of section *Modulation Measurements.*

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  IS 136 Non Signalling – Power and Modulation 3.8
  IS 136 Non Signalling – Spectrum and Receiver Quality 3.9
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  IS 136 Signalling – Power and Modulation 3.12
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3 Manual Control

This chapter gives a brief survey of the operating concept and structure of the user interface for IS 136-MS tests. The CMU was designed for maximum operating convenience and flexibility. All instrument functions are grouped together in menus, each of them provides a number of related configuration settings or displays a group of measured quantities. All menus show a similar structure so that many settings, once defined, can be used in several menu groups. Switchover between the different menu groups and test modes *(Non Signalling – Signalling)* is possible at any time.

In the following, the different measurement modes and measured quantities are discussed. Settings and measurement parameters frequently encountered are explained from a general point of view.

The formal aspects of measurement control are discussed in more detail in chapter 5 *(Remote Control – Basics)*. For a presentation of the CMU's control elements, menu types and dialog elements within the menus refer to chapter 3 of the operating manual for the CMU200 basic unit.

Menu Structure

The menus used to control IS 136-MS measurements can be arranged in different ways. From a functional point of view, they form the following groups:

- The two function groups *IS 136 800-MS* and *IS 136 1900-MS*
- The two test modes *Signalling* and *Non Signalling* provided for each function group
- General configurations *(Group Configuration, Connection Control)*, measurement groups *(Analyzer/Generator, Overview, Power vs Time, Modulation, Spectrum, Receiver Quality)*, and configurations specific to these measurement groups *(Power Configuration, Modulation Configuration, Spectrum Configuration)*.

In a more formal sense, the CMU uses main menus, popup menus, graphical measurement menus and dialog windows of various size. This aspect is discussed in chapter 3 of the operating manual for the CMU200 basic unit.

Test Modes

IS 136-MS measurements are performed in one of the two modes *Signalling* or *Non Signalling*. The *Non Signalling* mode is typically used for module tests or test of mobiles in a special "test mode". The *Signalling* mode serves to measure the mobile phone performance under realistic operating conditions where the CMU mimics an IS 136 base transceiver station.

Definition

The term signalling denotes all actions necessary to establish, control and terminate a communication between the base station (CMU) and the mobile phone. The signalling messages conveyed allow the mobile station and the network to discuss the management of issues either related to the user or concerning technical aspects of the communication.

Non Signalling Mode

In the IS 136 (digital TDMA) *Non Signalling* mode, the CMU generates an RF test signal and analyzes the signal with IS 136 characteristics (i.e. with definite level, definite phase and frequency, and bit content) retransmitted by the device under test. No signalling parameters are transferred, and no call is set up, so that test times can be reduced considerably. The test signal may be inside or outside the designated IS 136 channel range.

Normal burst signals are generated and analyzed. Transmitter quality measurements (burst power versus time, modulation parameters, adjacent channel power in frequency and time-domain representation) and receiver quality measurements (sensitivity) can be performed. The measurement may be triggered by an external signal.

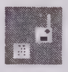
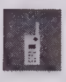
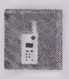
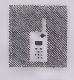
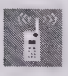
Signalling Mode

In the *Signalling* mode, the CMU transmits a control channel (DCCH) signal *(BS Signal)* to which the mobile phone can synchronize. With this signal, a call setup and registration of the mobile may be initiated by either the mobile or the CMU. A call from the current to another network can be set up, and an established call can be handed off from the current to another network.

The CMU is able to configure a broad range of network parameters, to vary the settings for control channel (DCCH) and traffic channel (DTC) signals, and to monitor the mobile-assisted handoff reports (MAHO) of the mobile phone. Both normal and shortened burst signals can be analyzed. Measurements of the burst power versus time, the modulation parameters, and the adjacent channel power in frequency and time-domain representation can be performed.

Symbols for Signalling Mode and State

The *signalling mode* and *state* is indicated to the left of the operating mode in each main menu and graphical measurement menu (see chapter 3 of CMU200 operating manual). The following symbols occur in function group *IS 136 800/1900-MS:*

	Non signalling mode
	Signalling mode, Signal Off
	Signalling mode, Signal On
	Signalling mode, Synchronized
	Signalling mode, Call Established

Configurations

The CMU offers a wide range of settings for the signal generators and analyzers, the signalling procedures, and the individual measurements. Configurations may apply to the whole function group *(Group Configuration, Connection Control,* signalling parameters) or to a particular measurement.

Group Configuration

The *Group Config.* softkey is located to the left of the title bar in each main and graphical measurement menu. It opens a popup menu with several tabs configuring

- The CMU receiver settings *(Input Level)*
- The trigger mode *(Trigger)*

All settings made in the *Group Config.* menu are valid for the whole function group. Most of them can be overwritten, however, by means of the softkeys and hotkeys offered in the graphical measurement menus.

Connection Control

The *Connect. Control* softkey is located to the right of the title bar in each main and graphical measurement menu. It opens a popup menu with several tabs configuring and controlling

- The signal generators and analyzers of the instrument *(Signal* in Non Signalling, *BS Signal* in Signalling mode)
- The RF connectors to be used and the external attenuation *(RF Input/Output)*
- The reference signal and the system clock *(Synch.)*
- In *Signalling* mode, all actions changing the CMU's signalling state *(Signalling)*
- In *Signalling* mode, a call *(Other Call)* or a handoff (Handoff) to another network
- In *Signalling* mode, parameters of the network and the mobile station under test *(Network)*

All settings made in the *Connect. Control* menu are valid for the whole function group.

Configuration of measurements

A popup menu offering specific settings is assigned to most measurement groups *(Power, Modulation, Spectrum)*. The following parameters can be defined in separate tabs:

- The repetition mode and stop condition for the measurement *(Control)*
- Tolerances for the measured quantities *(Limits, Limit Lines)*
- Statistic count and display mode *(Statistics)*

These settings are explained in more detail below (see section *General Settings* on page 3.5).

Configuration via hotkeys

The softkeys and associated hotkeys in the graphical measurement menus provide the most important configurations for the current measurement; see chapter 4 and chapter 3 of the CMU200 operating manual. Settings may via hotkeys supersede the corresponding *Group Configuration* settings.

Measurement Groups

Measurement results are indicated in two different ways:

- Discrete values and parameters are displayed in output fields, lists and tables. In remote control, these results are referred to as scalars.
- Traces are displayed in a Cartesian coordinate system, the time forming the x-axis scale. Relatively small sets of test points are generally viewed in a bar graph. In remote control, results of this type are referred to as arrays.

While the measurement is running in repetition mode *Continuous* (see page 3.5), the results are constantly updated. As shown in the table below, some of the measurement groups are different in the two test modes.

Table 3-1 Measurement Groups in the *Signalling* and *Non Signalling* Mode

Non Signalling	Signalling
Digital TDMA (Function groups IS 136 800/1900-MS)	
IS 136: Analyzer/Generator Configuration of the RF signal generated and analyzer settings; results of the peak and RMS power measurement.	**IS 136: Overview** Configuration of the traffic channel and indication of the scalar *Modulation* results and a selection of signalling parameters.
IS 136: Power vs Time Measurement of the normal burst power as a function of time with evaluation of the peak power, statistical results, limit check. Single points of the trace may be evaluated using graphical tools (markers, D-Line).	**IS 136: Power vs Time** Measurement of the normal or shortened burst power as a function of time with evaluation of the peak power, statistical results, limit check. The measurement can be performed at variable DTC MAC levels of the mobile phone. Single points of the trace may be evaluated using graphical tools (markers, D-Line).
IS 136: Modulation Measurement of the phase error, magnitude error or error vector magnitude derived from the modulation vector as a function of time. Scalar modulation quantities such as the frequency error, average and RMS phase error, I/Q imbalance, origin offset, amplitude droop, as well as statistical results and the results of the limit check are indicated in addition.	**IS 136: Modulation** Measurement of the phase error, magnitude error or error vector magnitude derived from the modulation vector as a function of time. Scalar modulation quantities such as the frequency error, average and RMS phase error, I/Q imbalance, origin offset, amplitude droop, as well as statistical results and the results of the limit check are indicated in addition. The measurement can be performed at variable DTC MAC levels of the mobile phone.
IS 136: Spectrum Measurement of the average and peak power in the adjacent, first and second alternate channels (frequency-domain representation), or the burst power in a given adjacent or alternate channel as a function of time (time-domain representation). Statistical evaluations and a limit check are performed in addition.	**IS 136: Spectrum** Measurement of the average and peak power in the adjacent, first and second alternate channels (frequency-domain representation), or the burst power in a given adjacent or alternate channel as a function of time (time-domain representation). Statistical evaluations and a limit check are performed in addition. The measurement can be performed at variable DTC MAC levels of the mobile phone.
IS 136: Receiver Quality Single-shot bit error rate test including limit check.	**IS 136: Receiver Quality** Configuration and readout of the mobile-assisted handoff (MAHO) report of the mobile phone and the current channel quality.

A graphical overview of the menus is given at the end of this chapter.

General Settings

A number of settings can be made in several of the configuration menus assigned to the measurement groups. In combination, these settings define the scope of the measurement, i.e. the number of bursts measured and the results displayed. The following brief overview is intended to avoid confusion of terms.

Application

Applications are different measurements belonging to the same measurement group. They effectively split up a measurement group into various related subgroups which can be configured separately.

They are selected via the *Application* softkey in the graphical measurement menus.

Statistic Count

The *statistic count* denotes the integer number of bursts which forms one measurement cycle. Together with the *repetition mode* and the *stop condition,* the statistic count determines when exactly the measurement is stopped.

The *statistic count* is set in the *Statistics* page of the configuration popup-menus assigned to the two measurement groups *Power, Modulation* and *Spectrum.*

Repetition Mode

The *repetition mode* defines when a measurement that is not stopped by a limit failure (see stop condition *On Limit Failure* below) will be completed. Two modes are available for all measurements:

Single Shot	The measurement is stopped after one *statistic count*.
Continuous	The measurement is continued until explicitly terminated by the user; the results are periodically updated.

A third repetition mode is available with remote control:

Counting	Repeated single shot measurement with a fixed number of statistic counts.

The *repetition mode* is set in the *Control* tab of the configuration popup-menus assigned to the three measurement groups *Power*, *Modulation* and *Receiver Quality.*

Stop Condition

A *stop condition* can be set for most measurements:

None	The measurement is performed according to its repetition mode, irrespective of the measurement results and the limits set.
On Limit Failure	the measurement is stopped as soon as one of the limits is exceeded, irrespective of the repetition mode set. If no limit failure occurs, it is performed according to its repetition mode.

The *stop condition* is set in the *Control* tab of the configuration popup-menus assigned to the measurement groups.

Display Mode

In graphical measurement diagrams, the *display mode* defines which of the measured and calculated traces is displayed if the measurement extends over several bursts. In general, traces are evaluated at a set of fixed, equidistant test points (samples). After n bursts, n measurement results per test point have been taken. After a single shot measurement extending over c bursts, c measurement results per test point are available.

Current	The current burst, i.e. the last result for all test points, is displayed.
Minimum	At each test point, the minimum value of all bursts measured is displayed.

Maximum	At each test point, the maximum value of all bursts measured is displayed.
Max./Min.	At each test point, the extreme value of all bursts measured is displayed, i.e. the maximum or minimum, whichever has a larger absolute value.
Average	At each test point, the arithmetic mean value of the last c bursts measured is displayed where c is the number of bursts forming one statistic count (sliding average; the statistics window continuously moves in time). As long as less than c bursts (one *statistic count)* have been evaluated, the arithmetic mean value of all bursts measured is displayed.

Note the difference in the calculation of *Average* on one hand, *Minimum, Maximum* and *Max./Min.* on the other hand, if the measurement extends over more than one statistic count (repetition mode *Continuous,* measurement time longer than one statistic count).

After evaluation of the different traces, the burst power is logarithmized and plotted in a semi-logarithmic diagram.

The *display mode* is set in the *Statistics* tab of the configuration popup-menus assigned to the measurement groups *Power, Modulation,* and *Spectrum.*

Calculation of statistical quantities

In *Power, Modulation,* and *Spectrum* measurements the statistical functions *Average, Minimum, Maximum* and *Minimum/Maximum* are applied to a set of test points depending on two independent parameters:

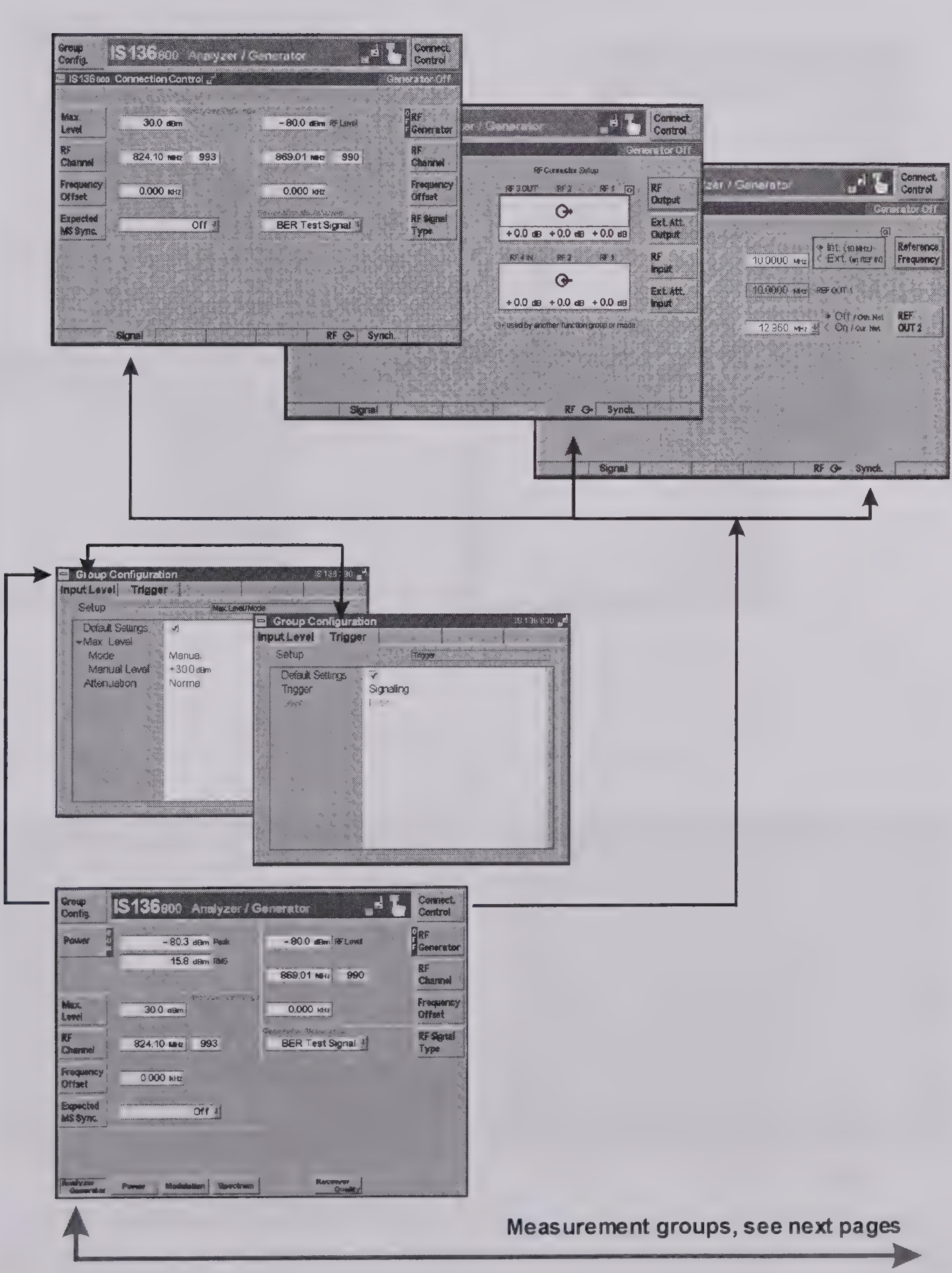
- The time, i.e. the abscissa values t_i, i ranging from 1 to the total number of test points comprising the trace.
- The burst number ranging from 1 to the number n of the current burst.

The result of the statistical operations depends on the parameter range considered and – in the case of statistics functions evaluated over several parameters – on the order of evaluations. This is why the definition of statistical quantities deserves some attention and is explained in the relevant sections in chapter 4. Some particular examples are:

1. In the *Power vs Time* menu, the quantity *Average Burst Power* denotes the average power of the current burst. i.e. the arithmetical mean value of all test points t_i located in the central (useful) part of the burst.
2. In the *Modulation* menu, the quantities *Frequency Error*, *Phase Error RMS* and *Phase Error Peak* are calculated for all bursts measured. The result for the current burst is entered in the *Current* column of the output table. The results in the *Minimum/Maximum* column correspond to the extreme value of the *Current* results calculated over all bursts measured. The results in the *Average* column correspond to the arithmetical mean value of the *Current* results calculated over the last c bursts measured where c is the number of bursts forming one statistic count.
3. In the *Spectrum* menu, the peak and effective burst power in the designated and the adjacent channels are calculated for all bursts measured. The quantities *ACP Peak* and *ACP RMS* are the results for the current burst. *ACP Peak (Peak)* denotes the maximum of all *ACP Peak* values in the current measurement, *ACP Peak (RMS)* the maximum of all *ACP RMS* values in the current measurement, and *ACP Avg. (RMS)* the average of all *ACP RMS* values in the last statistics cycle.

Menu Overview

IS 136 Non Signalling – General Configurations



IS136800 Analyzer / Generator – Connection Control – Generator Off

Max. Level: 30.0 dBm; RF Level: − 80.0 dBm

RF Channel: 824.10 MHz, 993; 869.01 MHz, 990

Frequency Offset: 0.000 kHz; 0.000 kHz

Expected MS Sync.: Off; RF Signal Type: BER Test Signal

RF Connector Setup: RF 3 OUT, RF 2, RF 1: +0.0 dB, +0.0 dB, +0.0 dB; RF 4 IN, RF 2, RF 1: +0.0 dB, +0.0 dB, +0.0 dB

Reference Frequency: Int. (10 MHz) / Ext. (at REF IN): 10.0000 MHz; REF OUT 1: 10.0000 MHz; REF OUT 2: 12.960 MHz, Off / On

Group Configuration – Input Level – Setup: Default Settings ✓; Max. Level: Mode Manual, Manual Level +30.0 dBm; Attenuation Normal

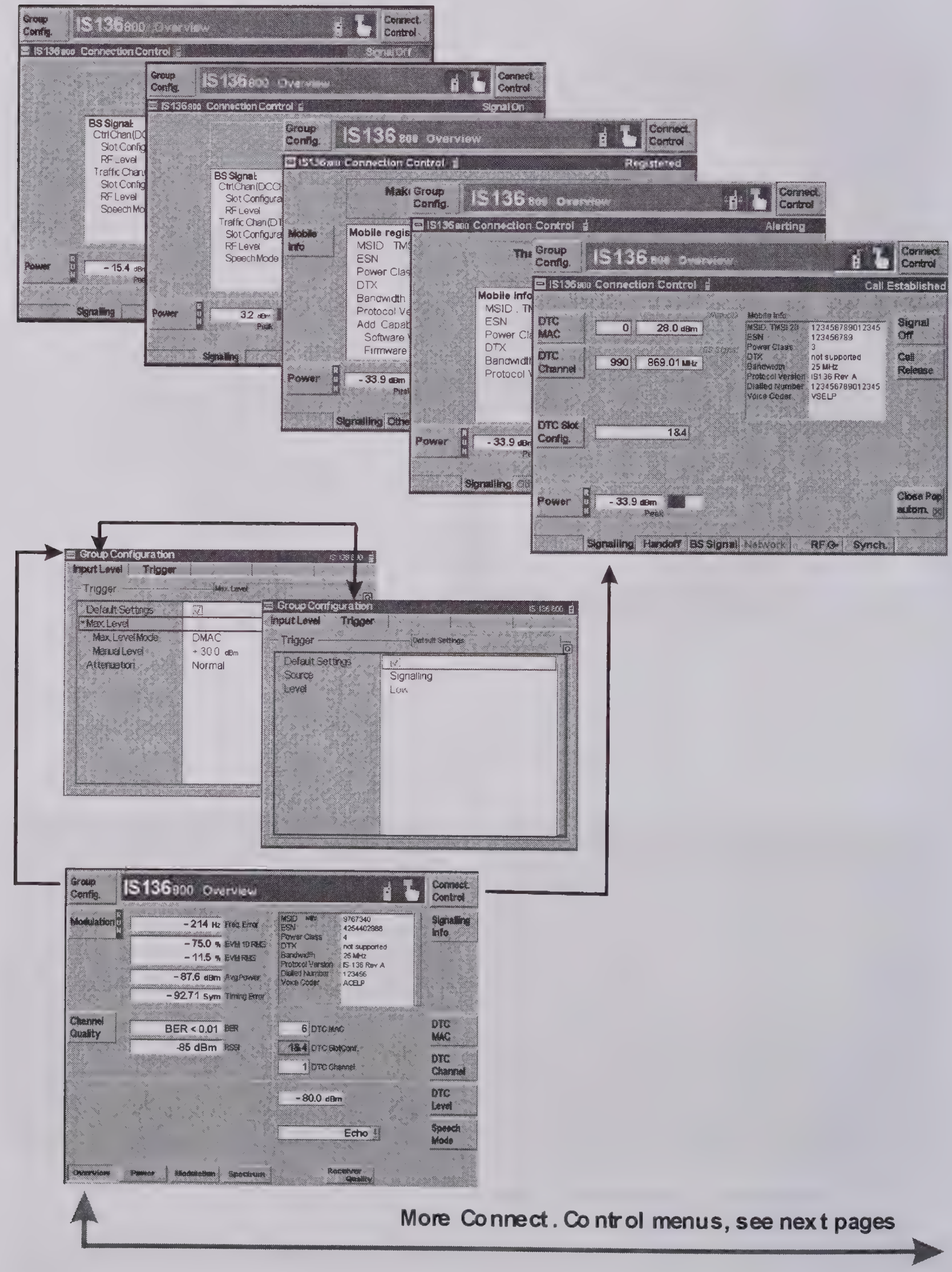
Group Configuration – Trigger – Setup: Default Settings ✓; Trigger Signaling

IS136800 Analyzer / Generator: Power −80.3 dBm Peak, 15.8 dBm RMS; RF Level −80.0 dBm; Max. Level 30.0 dBm; RF Channel 824.10 MHz, 993; 869.01 MHz, 990; Frequency Offset 0.000 kHz; 0.000 kHz; RF Signal Type BER Test Signal; Expected MS Sync. Off

Group Config.
Connect. Control
RF Generator
RF Channel
Frequency Offset
RF Signal Type
RF Output
Ext. Att. Output
RF Input
Ext. Att. Input
Signal
RF
Synch.
Analyzer Generator
Power
Modulation
Spectrum
Receiver Quality

Measurement groups, see next pages

IS 136 Signalling – General Configurations I


Group Config.
IS 136 800 Overview
Connect. Control
IS 136 800 Connection Control
Signal Off
Signal On
Registered
Alerting
Call Established
BS Signal:
CtrlChan(DCC)
Slot Configuration
RF Level
Traffic Chan(DTC)
Slot Configuration
RF Level
Speech Mode
Mobile Info
Mobile registration
Power
Peak
Signalling
Handoff
BS Signal
Network
RF
Synch.
DTC MAC
DTC Channel
DTC Slot Config.
Signal Off
Call Release
Close Pop autom.
Group Configuration
Input Level
Trigger
Modulation
Channel Quality
Signalling Info
DTC MAC
DTC Channel
DTC Level
Speech Mode
Overview
Power
Modulation
Spectrum
Receiver Quality
More Connect. Control menus, see next pages

IS 136 800 Connection Control – Call Established:

DTC MAC: 0, 28.0 dBm
DTC Channel: 990, 869.01 MHz
DTC Slot Config.: 1&4
Power: -33.9 dBm Peak

Mobile Info	
MSID, TMSI 20	123456789012345
ESN	123456789
Power Class	3
DTX	not supported
Bandwidth	25 MHz
Protocol Version	IS136 Rev A
Dialled Number	123456789012345
Voice Coder	VSELP

Group Configuration – Input Level:

Default Settings ☑
Max. Level
Max. Level Mode: DMAC
Manual Level: +30.0 dBm
Attenuation: Normal

Group Configuration – Trigger:

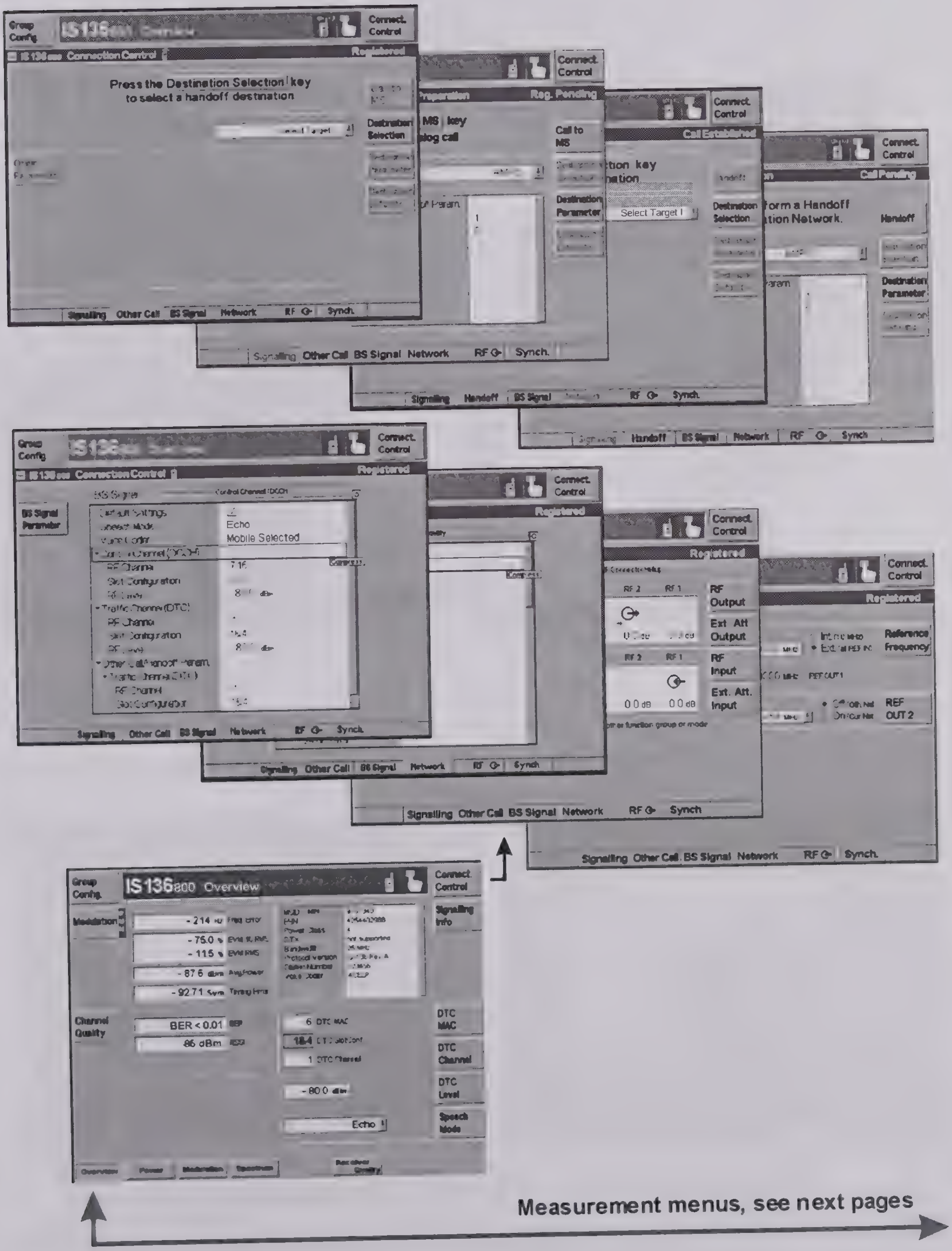
Default Settings ☑
Source: Signalling
Level: Low

IS 136 800 Overview:

Modulation: -214 Hz Freq. Error; -75.0 % EVM 10 RMS; -11.5 % EVM RMS; -87.6 dBm Avg.Power; -92.71 Sym Timing Error
Channel Quality: BER < 0.01 BER; -85 dBm RSSI
6 DTC MAC
1&4 DTC SlotConf.
1 DTC Channel
-80.0 dBm
Echo

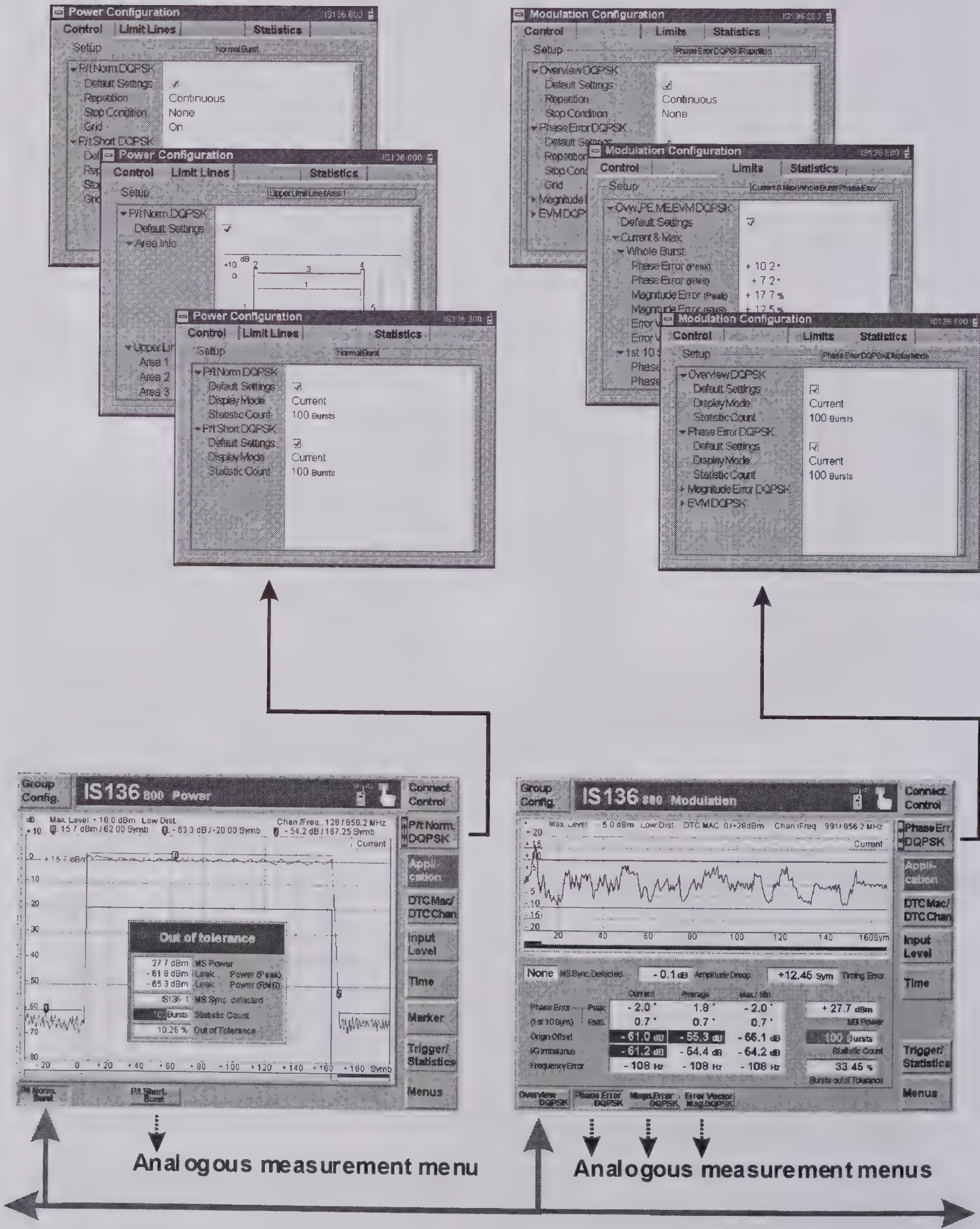
MSID MIN	9767340
ESN	4254402988
Power Class	4
DTX	not supported
Bandwidth	25 MHz
Protocol Version	IS-136 Rev A
Dialled Number	123456
Voice Coder	ACELP

IS 136 Signalling – General Configurations II


Press the Destination Selection key to select a handoff destination

Group Config
IS 136 Connection Control
Connect. Control
Registered
Destination Selection
Signalling
Other Call
BS Signal
Network
RF
Synch.
Reg. Pending
Call to MS
Destination Parameter
Call Established
Select Target
Handoff
Call Pending
BS Signal Parameter
Echo
Mobile Selected
RF Output
Ext. Att. Output
RF Input
Ext. Att. Input
Reference Frequency
REF OUT 2
IS 136800 Overview
Modulation
Channel Quality
BER < 0.01
86 dBm
Signalling Info
DTC MAC
DTC Channel
DTC Level
Speech Mode
Overview
Power
Modulation
Spectrum
Receiver Quality
Measurement menus, see next pages

IS 136 Signalling – Power and Modulation


Power Configuration
Control
Limit Lines
Statistics
Setup
NormalBurst
Modulation Configuration
Limits
Phase Error DQPSK Display Mode
IS136 800 Power
IS136 800 Modulation
Group Config.
Connect. Control
P/t Norm. DQPSK
Phase Err. DQPSK
Appli-cation
DTC Mac/ DTC Chan
Input Level
Time
Marker
Trigger/ Statistics
Menus
Out of tolerance
P/t Norm. Burst
P/t Short Burst
Overview DQPSK
Phase Error DQPSK
Magn. Error DQPSK
Error Vector Mag. DQPSK

Power Configuration

- P/t Norm DQPSK
  - Default Settings ☑
  - Display Mode: Current
  - Statistic Count: 100 Bursts
- P/t Short DQPSK
  - Default Settings ☑
  - Display Mode: Current
  - Statistic Count: 100 Bursts

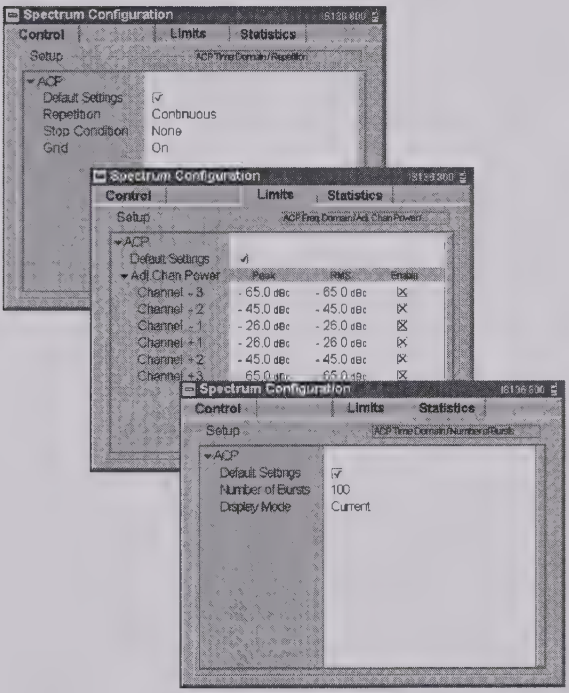
Modulation Configuration

- Overview DQPSK
  - Default Settings ☑
  - Display Mode: Current
  - Statistic Count: 100 Bursts
- Phase Error DQPSK
  - Default Settings ☑
  - Display Mode: Current
  - Statistic Count: 100 Bursts
- Magnitude Error DQPSK
- EVM DQPSK

Analogous measurement menu

Analogous measurement menus

IS 136 Signalling – Spectrum and Receiver Quality


Spectrum Configuration
IS136 800
Control
Limits
Statistics
Setup

ACP Time Domain/Repetition

- ACP
  - Default Settings ☑
  - Repetition: Continuous
  - Stop Condition: None
  - Grid: On

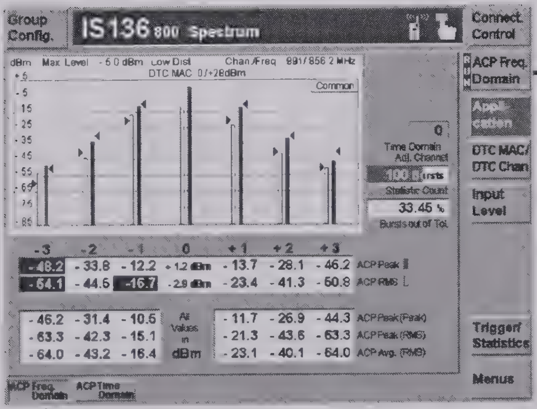
ACP Freq Domain/Adj Chan Power

- ACP
  - Default Settings ✓
  - Adj Chan Power

	Peak	RMS	Enable
Channel - 3	- 65.0 dBc	- 65.0 dBc	☒
Channel - 2	- 45.0 dBc	- 45.0 dBc	☒
Channel - 1	- 26.0 dBc	- 26.0 dBc	☒
Channel + 1	- 26.0 dBc	- 26.0 dBc	☒
Channel + 2	- 45.0 dBc	- 45.0 dBc	☒
Channel + 3	65.0 dBc	65.0 dBc	☒

ACP Time Domain/Number of Bursts

- ACP
  - Default Settings ☑
  - Number of Bursts: 100
  - Display Mode: Current

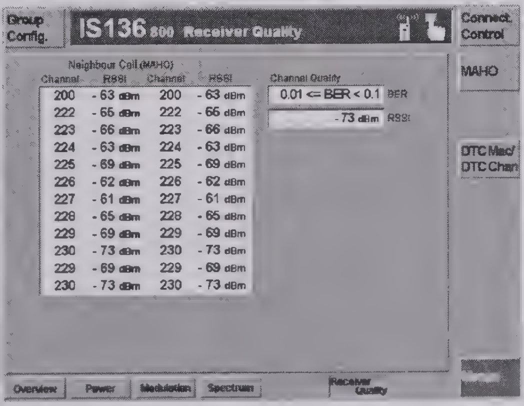

Group Config.
IS136 800 Spectrum
Connect. Control
ACP Freq. Domain
Appli-cation
DTC MAC/ DTC Chan
Input Level
Trigger/ Statistics
Menus
ACP Freq. Domain
ACP Time Domain
dBm
+5
-5
15
25
35
45
55
65
75
85
Common

dBm Max Level -5.0 dBm Low Dist Chan./Freq 991/856.2 MHz
DTC MAC 0/+28dBm

0
Time Domain Adj. Channel
100 Bursts
Statistic Count
33.45 %
Bursts out of Tol.

-3	-2	-1	0	+1	+2	+3	
- 48.2	- 33.8	- 12.2	+ 1.2 dBm	- 13.7	- 28.1	- 46.2	ACP Peak
- 64.1	- 44.6	- 16.7	- 2.9 dBm	- 23.4	- 41.3	- 50.8	ACP RMS

- 46.2	- 31.4	- 10.5	All Values in dBm	- 11.7	- 26.9	- 44.3	ACP Peak (Peak)
- 63.3	- 42.3	- 15.1		- 21.3	- 43.6	- 63.3	ACP Peak (RMS)
- 64.0	- 43.2	- 16.4		- 23.1	- 40.1	- 64.0	ACP Avg. (RMS)


Group Config.
IS136 800 Receiver Quality
Connect. Control
MAHO
DTC Mac/ DTC Chan
Overview
Power
Modulation
Spectrum
Receiver Quality

Neighbour Cell (MAHO)

Channel	RSSI	Channel	RSSI
200	- 63 dBm	200	- 63 dBm
222	- 65 dBm	222	- 65 dBm
223	- 66 dBm	223	- 66 dBm
224	- 63 dBm	224	- 63 dBm
225	- 69 dBm	225	- 69 dBm
226	- 62 dBm	226	- 62 dBm
227	- 61 dBm	227	- 61 dBm
228	- 65 dBm	228	- 65 dBm
229	- 69 dBm	229	- 69 dBm
230	- 73 dBm	230	- 73 dBm
229	- 69 dBm	229	- 69 dBm
230	- 73 dBm	230	- 73 dBm

Channel Quality
0.01 <= BER < 0.1 BER
- 73 dBm RSSI

Alternative measurement menu, see Power

Contents

4 Functions and their Application 4.1

TDMA Module Tests (Non Signalling Mode) **4.2**
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Measurement Configurations (Power Configuration) 4.11
Measurement Control (*Power* Configuration – Control) 4.11
Limit lines (*Power* Configuration – Limit Lines) 4.13
Statistics Cycles (Power Configuration – Statistics) 4.15
Modulation Measurements 4.17
Measurement Menu (Modulation) 4.18
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4 Functions and their Application

This chapter explains in detail all functions for the measurement of IS 136 mobile stations.

It is divided into two sections describing the following function groups and test modes:

1. Digital TDMA module tests *(IS 136 800/1900-MS Non Signalling)*
2. Digital TDMA mobile tests *(IS 136 800/1900-MS Signalling)*

The specifications for the two digital bands (800 MHz and 1900 MHz, corresponding to the function groups *IS 136 800-MS* and *IS 136 1900-MS)* are largely analogous. The two function groups are therefore described together in common sections; differences between the bands are pointed out throughout the text.

This reference chapter is organized according to the provided measurements and configurations (see graphical overview at the end of chapter 3). In contrast to chapter 6, *Remote Control – Commands,* general measurement configurations are relegated to the end of each section. The description of each softkey, select or input field is followed by the corresponding remote-control commands. Similarly, the description of the commands in chapter 6 also contains the corresponding menus of the user interface.

Each menu and each panel is briefly described first and then illustrated together with its call button. The menu functions are explained in the following way:

Softkey	Short function definition
Designation of select/input field	Definition of field function. Further description of the field: purpose, interaction with other settings, notes... *Parameter 1* Description of parameter 1 *Parameter 2* Description of parameter 2 ... Further description of the parameters: purpose, interaction with other settings, notes...
Remote control	`Remote-control command (long form) Parameter1 | Parameter2` `...`

For all numerical values, including their ranges and default settings, please refer to the description of the remote-control commands in chapter 6.

The description of the operating concept is to be found in chapter 3 of the operating manual for the CMU basic instrument; besides, a description of measurement control and the essential settings and an overview of the most important menus is given at the end of chapter 3 in the present IS 136 manual. A comprehensive index listing important keywords and the proper names of all menus, dialog elements and softkeys is appended to the end of this manual.

TDMA Module Tests (Non Signalling Mode)

This section provides detailed information on the measurement and configuration menus defined in function groups *IS 136 800/1900-MS Non Signalling*. It is organized like a typical measurement session including the following stages:

1. General settings *(Analyzer/Generator)* and display of generator signals
2. Measurement menus *(Power, Modulation, Spectrum, Receiver Quality)*: performance of the measurements, output of measurement results, specific measurement configurations
3. Global configurations *(Group Configuration, Connection Control)*

Measurement Menu Analyzer/Generator

The main menu *Analyzer/Generator* configures the signals of the RF generator and the signals received and analyzed by the CMU. At the same time, it controls the *Power* measurement and displays the current peak and RMS results.

With respect to layout and function, the two panels for signal configuration are identical with the panels that constitute the popup menu *Signal* in the menu group *Connection Control*:

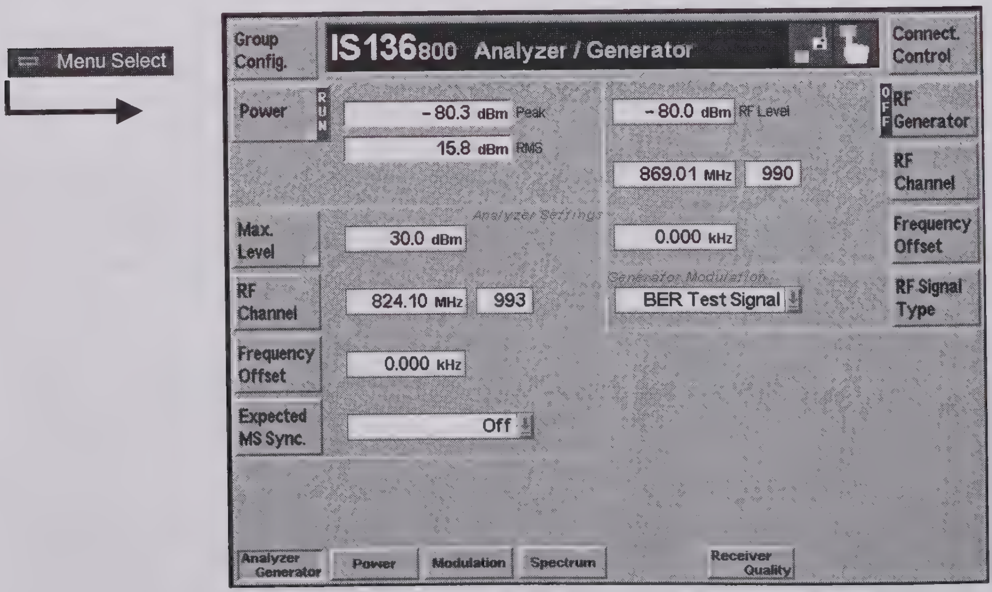
Panel Analyzer Settings	Analyzer control	See page 4.44
RF Generator	Generator control	See page 4.46

The remaining panel indicates the power parameters of the signal received by the CMU (peak and effective values):

Panel Power	Results of peak power measurement

The behavior of the signal power as a function of time can be analyzed in the measurement group *Power*.

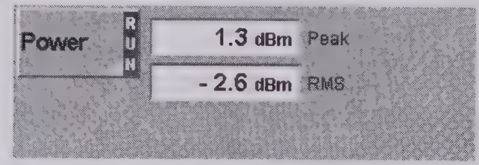
The main menu *Analyzer/Generator* is opened via the main menu *Menu Select* (with associated key at the front of instrument). It is linked with the remaining measurement menus of the function group *IS 136 800-MS Non Signalling Mode* via the hotkeys.


Menu Select
Group Config.
IS136800 Analyzer / Generator
Connect. Control
Power
RUN
OFF
RF Generator
RF Channel
Frequency Offset
Analyzer Settings
Generator Modulation
Max. Level
RF Channel
Frequency Offset
RF Signal Type
Expected MS Sync.
Analyzer Generator
Power
Modulation
Spectrum
Receiver Quality

Power: -80.3 dBm Peak, 15.8 dBm RMS
Max. Level: 30.0 dBm
RF Channel: 824.10 MHz 993
Frequency Offset: 0.000 kHz
Expected MS Sync.: Off
RF Generator: -80.0 dBm RF Level
RF Channel: 869.01 MHz 990
Frequency Offset: 0.000 kHz
Generator Modulation: BER Test Signal

Fig. 4-1 Measurement menu Analyzer / Generator

Power Panel



Power

1.3 dBm Peak

- 2.6 dBm RMS

The panel *Power* is linked with the *Power* vs. time measurement (see p. 4.4 ff) and contains one main softkey plus two output fields indicating the peak and effective power of the RF input signal. The effective power is also indicated in the info box in the graphical measurement menu *Power* (page 4.4).

Power

The *Power* softkey controls the *Power* measurement and indicates its status*(RUN | HLT | OFF).*

The measurement status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. The *Power* softkey corresponds to the *P/t* softkey of the *Power* measurement menu; the status labels on both softkeys always coincide.

Measurement configuration

Pressing the *Power* softkey twice opens the popup menus *Power Configuration* (see page 4.11).

Remote control

```
INITiate:POWer
ABORt:POWer
STOP:POWer
CONTinue:POWer
```

Peak
RMS

Peak and effective power of the current burst in dBm measured with a 100 kHz Gaussian filter. As no comparison is made between different bursts the result does not depend on the repetition mode (single shot or continuous measurement).

Remote control

```
READ[:SCALar]:POWer[:RESult]?
FETCh[:SCALar]:POWer[:RESult]?
SAMPle[:SCALar]:POWer[:RESult]?     Response: <Result>
```

Power Measurements

The menu group *Power* comprises the functions for measuring the RF power of the received burst signal as a function of time. The measurement results are displayed in the graphical measurement menu *Power,* the popup menu *Power Configuration* is used for configuration of the measurements.

Measurement Menu (Power)

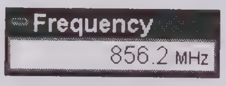
The graphical measurement menu *Power* shows the results of the burst analysis (power measurement).

- The main softkey *P/t Norm. DQPSK* indicates the status of the power measurement *(RUN | HLT | OFF)* and opens the configuration menu *Power Config.*
- The other softkeys to the right of the test diagram are combined with various hotkeys (the *hotkeys Channel, Frequency,* and *Offset* are associated with the softkey *Frequency* in the example below). If a softkey is selected and an associated hotkey pressed, a popup window will appear which indicates the current setting and enables an entry.

Example:

Frequency The *Frequency* softkey displays a hotkey bar including the hotkey *Frequency*.

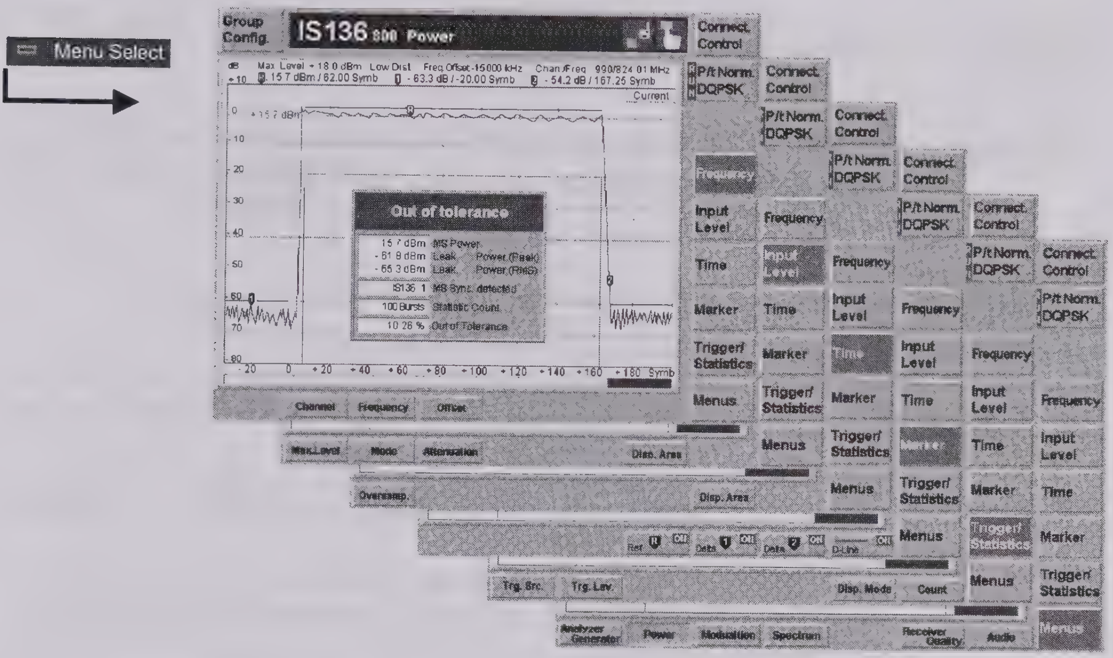
Frequency The *Frequency* hotkey opens the input window *Frequency*.



Input windows indicate the current parameter value (in this case: the frequency of the ongoing measurement) or a list of the possible settings. Parameters are changed by

- Overwriting/incrementing numerical values (for numeric parameters)
- Selecting from the list of parameters (for select parameters)

The measurement menu *Power* can be accessed from any other measurement menu of function group *IS 136 800/1900 Non Signalling* using the *Power* hotkey. It can be opened also from the *Menu Select* main menu (with the associated key at the front of the instrument).


Menu Select
Group Config.
IS136 800 Power
Connect. Control
P/t Norm. DQPSK
Frequency
Input Level
Time
Marker
Trigger/ Statistics
Menus
Channel
Frequency
Offset
Max.Level
Mode
Attenuation
Disp. Area
Oversamp.
Ref.
Delta
D-Line
Trg. Src.
Trg. Lev.
Disp. Mode
Count
Analyzer Generator
Power
Modulation
Spectrum
Receiver Quality
Audio
dB
Current
Symb
Out of tolerance

Max Level +18.0 dBm Low Dist Freq Offset -15000 kHz Chan./Freq 990/824.01 MHz
15.7 dBm / 62.00 Symb -63.3 dB / -20.00 Symb -54.2 dB / 167.25 Symb

15.7 dBm MS Power
-61.8 dBm Leak. Power (Peak)
-65.3 dBm Leak. Power (RMS)
IS136 1 MS Sync. detected
100 Bursts Statistic Count
10.26 % Out of Tolerance

Fig. 4-2 Measurement menu Power

Test settings

Frequency	The *Frequency* softkey activates the input of the signal frequency to be measured.
Frequency	The *Frequency* hotkey sets the signal frequency in MHz. The frequencies can be set in multiples of 10 kHz. If the entered frequency corresponds to an assigned channel frequency, the CMU automatically determines (and possibly overwrites) the channel number; see section *Control of Input and Output Signals (Connection Control – Signal)*, Panel *Analyzer Settings* on page 4.43.
Remote control	`[SENSe:]RFANalyzer:FREQuency <Frequency>`
Channel	The *Channel* hotkey sets the channel number. The CMU automatically determines (and possibly overwrites) the corresponding (reverse channel) channel frequency. See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.43.
Remote control	`[SENSe:]RFANalyzer:FREQuency:UNIT CH` `[SENSe:]RFANalyzer:FREQuency <CH_Number>`
Offset	The *Offset* hotkey sets the frequency offset. See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.43.
Remote control	`[SENSe:]RFANalyzer:FREQuency:OFFSet <Offset>`

Input Level

The *Input Level* softkey sets the input level.

Max. Level

The *Max. Level* hotkey determines the maximum expected input level in dBm.

See section *Input Level (Group Configuration – Input Level)* on page 4.53.

Remote control `[SENSE:]LEVel:MAXimum  <Level>`

Attenuation

The *Attenuation* hotkey selects a strategy for tuning the RF analyzer.

Normal	Mixer level in normal range.
Low Noise	Enhanced mixer level. This setting ensures the full dynamic range of the CMU and is therefore recommended for *Power* vs time and *Spectrum* measurements.
Low Distortion	Decreased mixer level. This setting ensures a high transmission reserve and is therefore recommended for *Modulation* measurements.

See section *Input Level (Group Configuration – Input Level)* on page 4.53.

Remote control `[SENSE:]LEVel:ATTenuation  NORMal | LNOIse | LDIStortion`

Disp. Area

The *Disp. Area* hotkey defines the displayed screen area.

It is possible to select either the complete burst (see Fig. 4-6), or zoom in to a particular area:

Full Range	Display of complete burst in the time range –20 symb. to 181 symb. and levels between –80 dBc and +10 dBc
Useful Part	full time range, trace magnified around the reference level (–60 dBc to +10 dBc)
Left Upper Corner	trace magnified around the left upper corner (symbols –8 to +10, –40 dBc to +10 dBc)
Rising Edge	full level range, time axis from –8 symb. to 10 symb.
Right Upper Corner	trace magnified around the right upper corner (symbols 156 to 174, –40 dBc to +10 dBc)
Falling Edge	full level range, time axis from –150 symb. to 168 symb

The screen setting and the measurement do not affect each other.

Remote control No command, screen configuration only.

Time

The *Time* softkey configures the abscissa (time axis).

Oversamp.

The *Oversamp.* hotkey defines the oversampling factor of the displayed signal.

The oversampling factor determines the resolution of the trace; it indicates how many samples are taken and displayed per symbol. Oversampling factors of 1 (corresponding to 202 test points over the whole display range) or 8 (corresponding to 1616 test points) are available.

Remote control `CONFigure:POWer[:NBURst][:DQPSk]:TIME:OVERsampling 1 | 8`

Disp. Area

The *Area* hotkey determines the displayed screen area, see above.

Marker

The *Marker* softkey positions up to 3 markers and a D-line in the test diagram and reads their values.

Markers	are graphical tools for marking points on the trace and for numerical output of measured values. The measurement menu *Power* provides a reference marker and two further markers which permit to measure differences (relative or absolute delta markers 1 and 2). The coordinates of the three markers are indicated in the format *Ordinate value (level)/abscissa value (time)* in a parameter line above the test diagram. The position of the reference marker is expressed in absolute units (level in dBm and time in symbols), the delta marker in absolute or relative units (relative level in dB or time differences from the reference marker).
D-line	The D-line (display line) is a horizontal line that can be positioned to mark and read out an arbitrary level in the test diagram.

Ref R

The hotkey *Ref. R* switches the reference marker on or off (use the *ON/OFF* key).

The reference marker is represented by the symbol R in the test diagram. The marker position (abscissa) is defined in the input field *Ref. Marker R*. The marker can be positioned to arbitrary time values. It is switched off in the default setting *(Off)*. The marker level is given by the trace at the marker position.

The position of all markers can be varied using the rotary knob.

Remote control: No command, screen configuration only.

Rel 1

The *Rel. 1* hotkey switches the delta marker 1 on or off (use the *ON/OFF* key).

The delta marker 1 is represented by the symbol 1 in the test diagram. The marker position (abscissa) is defined in the input field *Rel. Marker 1*. The marker can be positioned to arbitrary time values. If its position is outside the diagram area it will be invisible and its coordinates will be "<abscissa_value> / - - -". The marker is switched off in the default setting *(Off)*. The marker level is given by the trace at the marker position.

The toggle switch *Rel 1 Config* pops up when the hotkey is pressed for the second time. It defines whether the position of delta marker 1 is measured and indicated in absolute units (dBm) or relative to the reference marker.

Remote control: No command, screen configuration only.

Rel 2

The *Rel. 2* hotkey switches the delta marker 2 on or off (use the *ON/OFF* key).

Functions and remote control are analogous to delta marker 1.

D-Line

The *D-Line* hotkey switches the D-line in the test diagram on or off.

The D-line is a horizontal, colored auxiliary line in the test diagram and is used for marking a level value and for measuring level differences. The level (ordinate) is defined in the input field *D-Line*. The D-line can be positioned in the whole diagram area, the default setting is *Off*.

The switch *D-Line Config.* pops up when the hotkey is pressed for the second time. It defines whether the D-line level is expressed in absolute units (in dBm, setting *absolute)* or relative to the *Max. Level* (in dB, setting *relative)*.

Remote control No command, screen configuration only.

Trigger Statistics

The *Trigger/Statistics* softkey sets the trigger condition, the statistics mode and the number of statistics cycles.

Trg. Src.

The *Trg. Src.* hotkey determines the trigger mode.

Free Run	Triggering by incoming burst that the software searches within a TDMA frame
RF Power	Triggering on power (rising edge) of incoming burst, broadband trigger at the front end
IF Power	Narrow-band trigger
Extern	External trigger signal fed in via connector AUX3

See section *Trigger (Group Configuration – Trigger)* on page 4.55.

Remote control

```
TRIGger[:SEQuence]:SOURce
              FRUN | RFPower | IFPower | EXTern
```

Trg. Lev.

The *Trg. Lev.* hotkey determines the trigger condition.

The *Trigger Level* field determines the trigger threshold if the measurement is triggered by the *RF Power* or *IF Power*.

See section *Trigger (Group Configuration – Trigger)* on page 4.55.

Remote control

```
TRIGger[:SEQuence]:THReshold LOW | MEDium | HIGH
```

Disp. Mode

The hotkey *Disp. Mode* determines the display mode.

The *Current* burst, the *Average, Minimum* or the *Maximum* over a given number of bursts can be displayed. See section *Statistics Cycles (Power Configuration – Statistics)* on page 4.15.

Remote control no display mode set, the four traces are accessible via

```
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:CURRent:[:RESult]?
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:AVERage:[:RESult]?
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:MINimum:[:RESult]?
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:MAXimum:[:RESult]? etc.
```

Count

The hotkey *Count* defines the number of bursts per statistics cycle.

1 to 1000 Bursts	Number of bursts per statistics cycle

See section *Statistics Cycles (Power Configuration – Statistics)* on page 4.15.

Remote control

```
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol
                                        <Mode>,1 ... 1000 | OFF
```

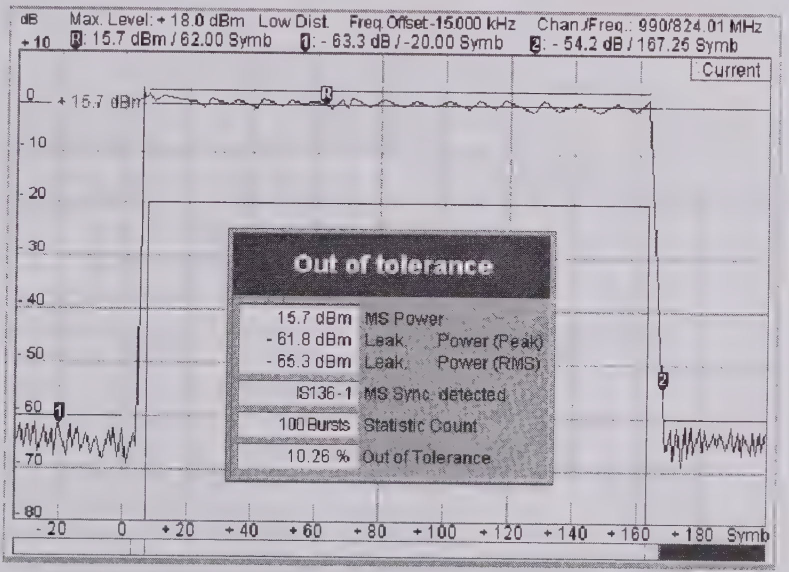
Menus The *Menus* softkey displays the hotkey bar for changing to the other measurement menus.

Measurement Results

The values shown in the measurement menu *Power* can be divided into three groups:

- Setting values
- Scalar measurement results (single values)
- Arrays (the trace plotted as a function of time)

These values are indicated in two parameter lines, the test diagram and an info box:



Parameter line 1|2

Test diagram

Info box

Max. Level: + 18.0 dBm Low Dist. Freq.Offset -15.000 kHz Chan./Freq.: 990/824.01 MHz

R: 15.7 dBm / 62.00 Symb 1: - 63.3 dB / -20.00 Symb 2: - 54.2 dB / 167.25 Symb

Out of tolerance

15.7 dBm	MS Power
- 61.8 dBm	Leak. Power (Peak)
- 65.3 dBm	Leak. Power (RMS)
IS136 - 1	MS Sync. detected
100 Bursts	Statistic Count
10.26 %	Out of Tolerance

Fig. 4-3 Display of measurement results (Power menu)

Settings/ scalar measurement results Settings and scalar measurement results are indicated in the two parameter lines above the test diagram and in the info box, a popup window in the middle of the graphical screen *Power.*

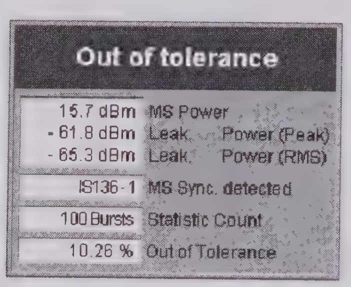
1st parameter line The first parameter line contains the following settings:

Max. Level	Maximum expected input level as set in *Max. Level* (see p. 4.53).
Attenuation	Setting for the attenuation of the input level *(Normal, Low Noise, Low Distortion)*
Freq. Offset	Frequency offset with respect to the nominal channel frequency
Chan./Freq	RF channel and associated frequency

2nd parameter line The second parameter line contains the following marker values:

R	Level and time of reference marker
1	Level and time of delta marker 1 (setting *absolute*) or difference from reference marker (setting *relative*)
2	Level and time of delta marker 2 (setting *absolute*) or difference from reference marker (setting *relative*)

Info box



Out of tolerance

15.7 dBm	MS Power
- 61.8 dBm	Leak. Power (Peak)
- 65.3 dBm	Leak. Power (RMS)
IS136 - 1	MS Sync. detected
100 Bursts	Statistic Count
10.26 %	Out of Tolerance

The info box contains the following settings:

Statistic Count	Number of bursts per statistics cycle.

In addition, the following scalar results are indicated:

MS Power	Average power of current burst measured with a 100 kHz Gaussian filter (irrespective of the display mode selected, i.e. of the current trace).
Leak. Power	Mobile station transmit power during the carrier-off state; both the maximum (Peak) and effective (RMS) value is indicated; the latter is averaged over the carrier-off period[1].
MS Sync. Detect.	IS 136 standard synchronization pattern detected (see section *Control of Input and Output Signals (Connection Control – Signal)* on page 4.43 ff). *No TSC* is indicated if no synchronization pattern could be found; '---' if the measurement is switched off (search not activated).
Burst Matching	*OK* or message if the result is out of the tolerance template defined in the *Limit Lines* tab of the configuration menu, see page 4.13 ff. The message refers to the displayed trace which in turn depends on the display mode selected. The following messages may be displayed:

OK	Trace matches the tolerance template
Fail	Trace does not match the tolerance template
Invalid	Burst too short or synchronization pattern not found
Out of Range	No power ramp found
No TSC	Synchronization pattern not found
Overflow	Signal level too high
Underflow	Signal level too low
No trigger	No trigger signal detected in external/RF/IF trigger mode
Off	Measurement off

Remote control

Settings are read out using the query corresponding to the setting command (setting command with appended question mark).

For scalar measurement results:

```
READ[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]
FETCh[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?
SAMPle[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?

CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:CURRent
                                        [:RESult]:MATChing?
```

---

[1] For *Max. Level* settings larger than +10 dBm the leakage power is determined according to the 2-shot method described on page 4.15.

Traces (arrays) The trace is displayed as a continuous curve in the test diagram together with the limit lines, markers and the D-line, if defined.

The trace in the *Power* measurement menu shows the measured burst power (in dB) as a function of time (in symbols). The displayed result depends on the test settings. The display mode for the trace *(Minimum, Maximum, Average, Current)* is indicated in the upper right corner of the diagram.

The scale of both axes can be adjusted via the *Area* hotkey (see above).

Remote control

```
READ:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?
FETCh:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?
SAMPle:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]? etc.
CALCulate:POWer[:NBURst][:DQPSk]:CURRent[:RESult]
   :MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?   etc.
```

Measurement Configurations (Power Configuration)

The popup menu *Power Configuration* contains three tabs which determine the parameters of the power measurement including the error tolerances.

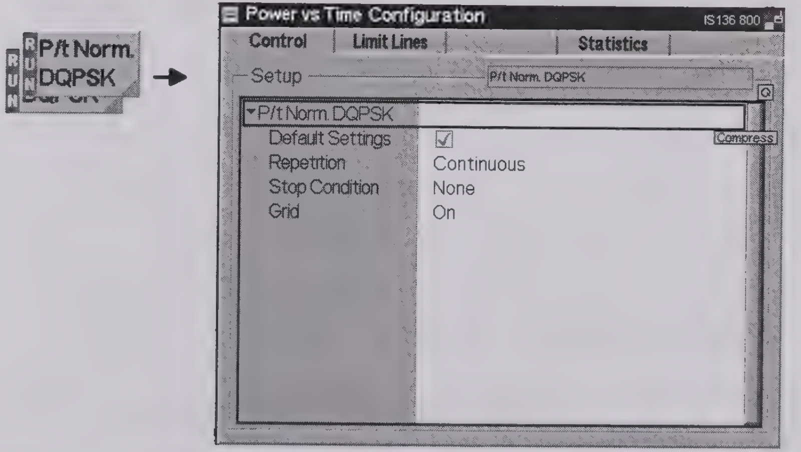
The popup menu *Power Configuration* is activated by pressing the softkey *Power* twice. It is possible to change between the tabs by pressing the associated hotkeys.

Measurement Control (*Power* Configuration – Control)

The tab *Control* controls the power measurement by determining

- The *Repetition* mode,
- The *Stop Condition* for the measurement.

Besides, it configures the power diagram by adding a *Grid* or not.



▾P/t Norm. DQPSK

Default Settings	☑
Repetition	Continuous
Stop Condition	None
Grid	On

Fig. 4-4 Power Configuration – Control

Default Settings The *Default* switch assigns default values to all settings in the *Control* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote Control `CONFigure:Power[:NBURst][:DQPSk]:CONTrol:DEFault ON | OFF`

Repetition

The *Repetition* table row determines the repetition mode:

Single Shot	Single-shot measurement: the measurement is stopped after a statistics cycle, i.e. after the number of bursts/evaluation periods set in the configuration menu *Statistics* (page 4.15). It is stopped even before if the stop condition *On Limit failure* is set and if any of the tolerances are exceeded during this cycle. A stopped measurement is indicated by the status display *HLT* in the softkey *Power*.
Continuous	Continuous measurement: The CMU continues the measurement until it is terminated explicitly, or until the stop condition (see below) is met. The output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the softkey *Power*.

Single shot should be selected to obtain a measurement result under fixed conditions. The continuous mode is suitable for monitoring the evolution of a measured quantity in time, for example for adjustments.

Note: *In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, see chapter 6 of this manual.*

Remote control

```
CONFigure:Power[:NBURst][:DQPSk]:CONTrol:REPetition
        CONTinuous | SINGleshot | 1 ... 10000,<StopCondition>,
                                                <Stepmode>
```

Stop Condition

The *Stop Condition* table row defines a stop condition for the measurement:

None	Continue measurement even if tolerance is exceeded
On Limit Failure	Stop measurement if tolerance is exceeded

Remote control

```
CONFigure:Power[:NBURst][:DQPSk]:CONTrol:REPetition
           <REPetition>,SONerror | NONE,<Stepmode>
```

Grid

The *Grid* table row switches the grid in the graphical test diagram on or off. By default, the grid is switched on.

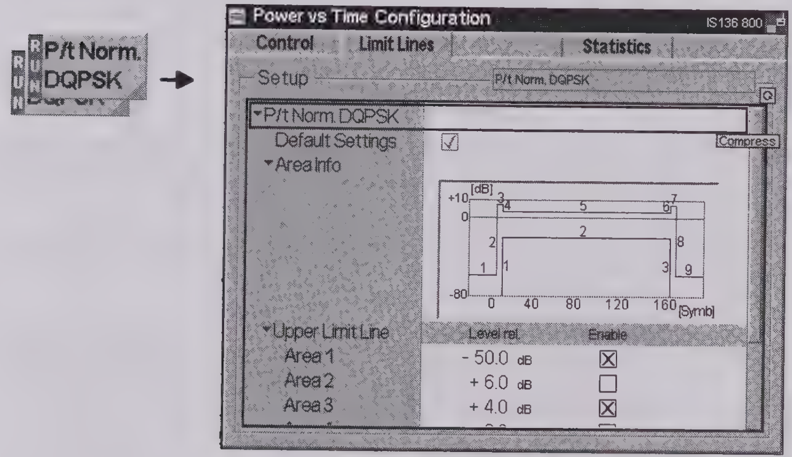
Remote control

```
CONFigure:Power[:NBURst][:DQPSk]:CONTrol:GRID  ON | OFF
```

Limit lines (*Power* Configuration – Limit Lines)

The tab *Limit Lines* defines the limit lines for the *Power* measurement. The tab enables

- A preview of the defined limit lines *(Area Info)*
- Definition of the limit lines for the normal burst section by section *(Limit Line Definition)*


P/t Norm.
DQPSK
Power vs Time Configuration
IS136 800
Control
Limit Lines
Statistics
Compress
[dB]
+10
0
-80
0
40
80
120
160
[Symb]
1
2
3
4
5
6
7
8
9

Setup: P/t Norm. DQPSK

P/t Norm. DQPSK

Default Settings ☑

Area Info

Upper Limit Line	Level rel.	Enable
Area 1	- 50.0 dB	☒
Area 2	+ 6.0 dB	☐
Area 3	+ 4.0 dB	☒

Fig. 4-5 Power Configuration – Limit Lines

Burst power As a function of time, the bursts can be divided into different areas. These areas are used as a basis for the definition of the limit lines and are shown in the following diagram (Fig. 4-6).

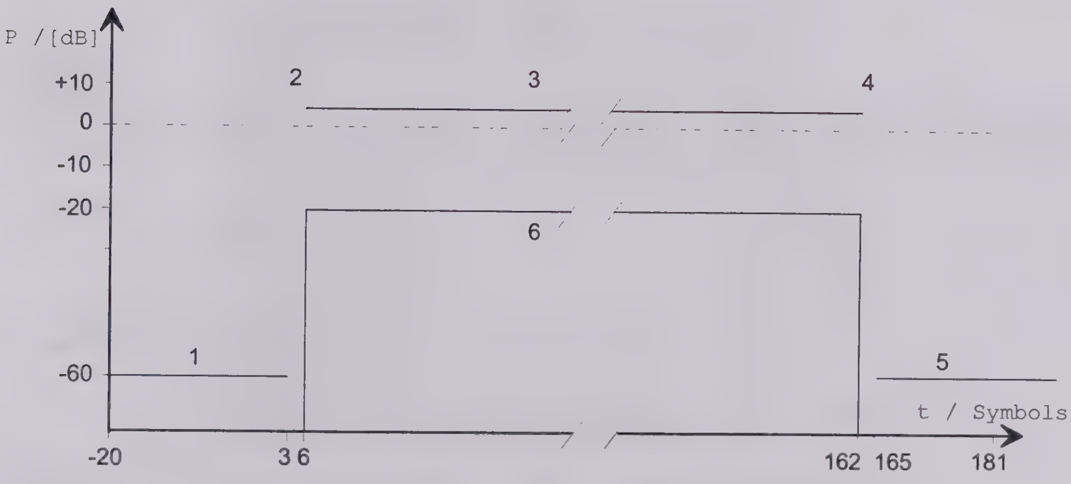

P / [dB]
+10
0
-10
-20
-60
1
2
3
4
5
6
t / Symbols
-20
3 6
162
165
181

Fig. 4-6 Tolerance mask (limit lines) for normal bursts

Note: *In the non-Signalling mode, normal bursts can be measured by the CMU. The reference level (0 dB line) is equal to the power of the received signal in the carrier-on state. The analysis of normal and shortened bursts from mobiles with various attenuation codes (MAC) is described in section* IS 136 Measurements with Signalling.

Default The *Default* switch assigns default values to all fields in the *Limit Lines* tab (the default values for the limit lines correspond to the tolerance template in Fig. 4-6; they are also quoted in chapter 6 of this manual).

Remote control

```
CONFigure:Power[:NBURst][:DQPSk]:LIMit[:LINE]
                  [:ASYMmetrical]:DEFault   ON | OFF
```

Area Info The *Area Info* diagram represents a simplified preview of the defined tolerance template.

Remote control –

Upper Limit Line The table *Upper Limit Line* defines the upper limits line for the measured burst power. To this end, the normal burst is divided into 5 areas; within each area, the upper limit is defined by a constant line.

The individual columns in the table section *Upper Limit Line* have the following meaning:

Area	Area number as in Fig. 4-6, Area No. 1 to 5
Level rel. [dB]	Level in the area in units relative to the carrier. This means that the reference level (0-dB line) is the carrier power averaged over the useful part of the burst.
Enable	Valid (enabled) or invalid limit line. In an invalid area, the limit check is disabled as well.

The ranges for the upper limit lines, i.e. of the quantity *Level rel.* vary according to the area numbers. The default values for all limit lines can be set by means of the *Default* switch.

Remote control

```
CONFigure:Power[:NBURst][:DQPSk]:LIMit[:LINE]
      [:ASYMmetrical]:UPPer:AREA<nr>:ENABle   ON | OFF
CONFigure:Power[:NBURst][:DQPSk]:LIMit[:LINE]
      [:ASYMmetrical]:UPPer:AREA<nr>  <LevelRel>,<Enable_Area>
```

Lower Limit Line The table *Lower Limit Line* defines the lower limits lines for the measured burst power. According to the specifications of the standard, the lower limit line for the normal burst consists of only one area with constant limit value.

The individual columns in the table section *Lower Limit Line* have the following meaning:

Area F	Area number as in Fig. 4-6.
Level rel. [dB]	Level in the area in units relative to the carrier. This means that the reference level (0-dB line) is the carrier power averaged over the useful part of the burst.
Enable	Valid (enabled) or invalid limit line. In an invalid area, the limit check is disabled as well.

The range for the lower limit lines, i.e. of the quantity *Level rel.* varies according to the areas. The default values for all limit lines can be set by means of the *Default* switch.

Remote control

```
CONFigure:Power[:NBURst][:DQPSk]:LIMit[:LINE]
      [:ASYMmetrical]:LOWer:AREA<nr>:ENABle   ON | OFF
CONFigure:Power[:NBURst][:DQPSk]:LIMit[:LINE]
      [:ASYMmetrical]:LOWer:AREA<nr>  <LevelRel>,<Enable_Area>
```

Leakage Power The entry *Leakage Power* specifies an upper limit for the effective transmit power of the mobile station during the carrier-off state.

The leakage power is indicated in the info box of the *Power* measurement menu *(Leak. Power (RMS))*. If it exceeds the specified limit, the output field turns red with a white triangle pointing upwards.

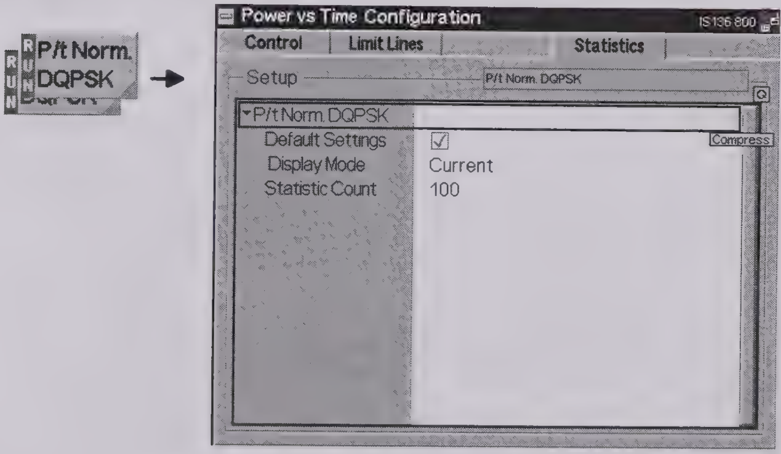
For large maximum expected input levels, the dynamic range of the tester may not be sufficient to cover the power range below –60 dBm relevant for leakage power measurements (see Fig. 4-6). To overcome this difficulty, the CMU switches to a 2-shot mode as soon as the maximum input level (set via the *Input Level – Max. Level* hotkey) exceeds +10 dBm:

1. The power vs. time measurement is performed under normal conditions. The power ramp is measured; no valid leakage power results are indicated ('---').
2. The tester is overdriven, i.e. the mixer level is enhanced by +25 dB, with a corresponding increase of the signal-to noise ratio (for comparison, see the *Low Noise* option described in section *Input Level (Group Configuration – Input Level)* on page 4.53). In this test mode, the leakage power can be measured for maximum input levels ranging from +10 dBm to the maximum allowed input level of all three RF input connectors.

The 2-shot mode is not available in repetition mode *Continuous*. In repetition mode *Single Shot*, it is automatically deactivated for maximum input levels below +10 dBm where the burst power and leakage power can be measured simultaneously.

Statistics Cycles (Power Configuration – Statistics)

The tab *Statistics* defines the number of bursts/evaluation periods forming a statistics cycle *(Statistic Count)* and the power ramp displayed *(Display Mode)*.



Default Settings ☑
Display Mode Current
Statistic Count 100

Fig. 4-7 Power Configuration – Statistics

Default The *Default* switch assigns default values to all settings in the *Statistics* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote control `CONFigure:Power[:NBURst][:DQPSk]:CONTrol:DEFault ON | OFF`

Display Mode

The *Display Mode* table row defines which of the four measured and calculated traces is displayed. The traces differ in the way the burst power *p(t)* at a fixed point in time *t* is calculated if the measurement extends over several bursts:

Current	Measured value for current burst
Minimum	Minimum over a number of bursts
Maximum	Maximum over a number of bursts
Average	Average value over a number of bursts

The number of bursts for calculation of the statistics values *Minimum, Maximum* and *Average* – and thus the result – depends on the measurement mode set (see section *Measurement Control (Power Configuration – Control)* on page 4.11). In detail, this implies:

Single shot	Display of minimum, maximum and average value from the performed statistics cycle.
Continuous	Display of minimum and maximum from all bursts already measured. The **average value**, however, refers to the last statistics cycle.

Remote control

no display mode set, the four traces are accessible via

```
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:CURRent:[:RESult]?
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:AVERage:[:RESult]?
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:MINimum:[:RESult]?
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:MAXimum:[:RESult]? etc.
```

Statistic Count

The table row *Statistic Count* defines the length of the statistics cycle in bursts.

1 to 1000 Bursts	Number of bursts per statistics cycle

The settings *1* and *Off* (press *ON/OFF* key) are equivalent. A statistics cycle is equal to the duration of single-shot measurements *(*see section *Measurement Control (Power Configuration – Control)* on page 4.11).

Remote control

```
CONFigure:Power[:NBURst][:DQPSk]:CONTrol
                  <MODE>,1 ... 1000 | OFF
```

Modulation Measurements

The menu group *Modulation* comprises the functions for measurement of the modulation parameters described below and matching of the respective tolerance limits. The measurement results are displayed in the graphical measurement menu *Modulation,* the popup menu *Modulation Configuration* is used for configuration of the measurements.

Quantities characterizing the modulation accuracy are determined as follows:

The actual modulation vector of the received signal from the mobile station is measured over the complete burst and stored. From a comparison of this measured modulation vector with the (computed) ideal signal vector, three non-redundant quantities are calculated (see Fig. 4-8):

Phase error	Difference in phase between the measured and the ideal signal vector.
Magnitude error	Difference between the magnitudes of the measured and the ideal signal vector.
Error vector magnitude	Magnitude of the vector connecting the measured and the ideal signal vector. In contrast to the previous quantities, the error vector magnitude cannot be negative.

These three quantities are calculated as a function of time and displayed over the whole useful part of the burst (symbol 6 to symbol 162), each of them in a separate graphical measurement menu. In addition, the peak and RMS values of all three quantities are calculated (over the whole display range or over the first ten symbols only) and displayed.

Finally, the *Modulation* measurement provides the following scalar quantities:

Origin offset	Origin offset in the I/Q constellation diagram reflecting a DC offset in the baseband. The origin offset corresponds to an RF carrier feedthrough.
I/Q imbalance	Amplitude difference between the in-phase (I) to the quadrature (Q) components of the measured signal, normalized and logarithmized. The I/Q imbalance corresponds to an unwanted signal in the opposite sideband.
Frequency error	Difference of the measured frequency from the expected frequency.
Amplitude droop	Variation of the signal level between the first (symbol no. 6) and the last valid symbol (symbol no. 162) in the burst in dB.

For the **tolerance check** all three phase error curves can be fitted into a tolerance template and checked.

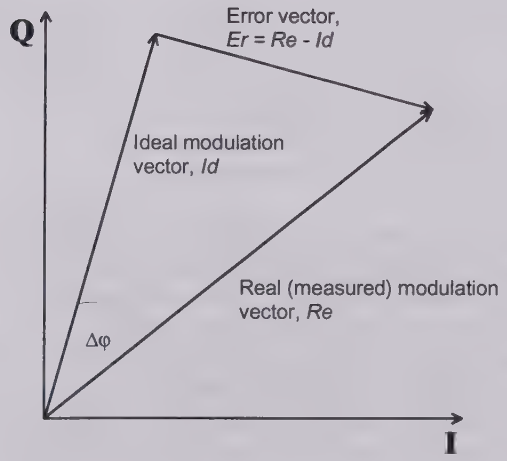

Q
Error vector,
Er = Re - Id
Ideal modulation vector, *Id*
Real (measured) modulation vector, *Re*
Δφ
I

Fig. 4-8 Modulation errors in the I/Q vector diagram

The I/Q vector diagram shows the following quantities measured in the *Modulation* menu:

Δφ	Phase error
| *Re* | - | *Id* |	Magnitude error
| *Er* | = | *Re* – *Id* |	Error vector magnitude (EVM)

Note: *The test functionality of the CMU is beyond the requirements of the standard where nothing regarding the phase error and magnitude error is specified.*

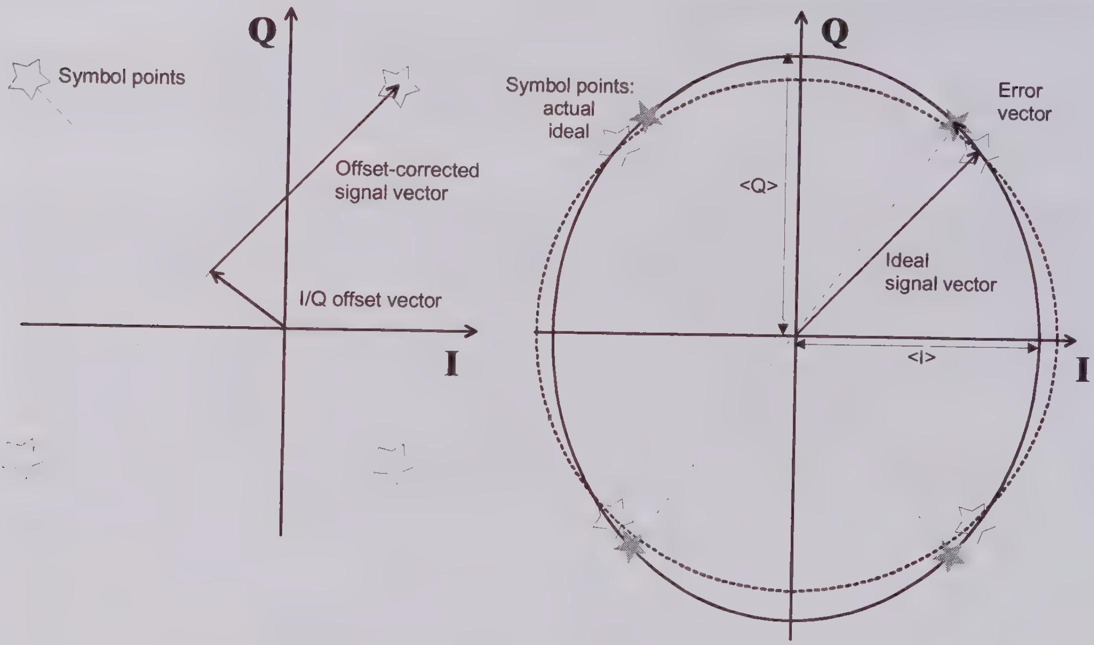


Fig. 4-9 Modulation errors in the I/Q constellation diagram

The I/Q offset in dB is the logarithmic ratio of the I/Q offset vector (i.e. the estimated DC-offset of the measured signal) to the offset-corrected signal vector:

$$\text{Origin Offset} = 20\log\frac{|\text{I/Q offset vector}|}{|\text{Offset-corrected signal vector}|}$$

The I/Q imbalance in dB is equal to the difference between the estimated I and Q amplitudes of the measured signals, which are normalized and logarithmized as follows:

$$\text{I/Q Imbalance} = 20\log\frac{|<I> - <Q>|}{|<I> + <Q>|}$$

Measurement Menu (Modulation)

The graphical measurement menu *Modulation* displays the measurement results:

- The main softkey *Overview DQPSK* (which changes to *Phase Error DQPSK, Magn. Error DQPSK,* or *EVM DQPSK* if the corresponding application is selected) indicates the measurement status *(RUN | HLT | OFF)* and opens the configuration menu *Modulation Configuration* (press twice).
- The softkeys *Application, Frequency, Input Level, Trigger/Statistics and Menus* to the right of the test diagram are combined with various hotkeys. If a softkey is selected and an associated hotkey pressed, a popup window will appear which indicates a setting or enables an entry (see section *Measurement Menu (Power)* on page 4.4).

The measurement menu *Modulation* can be accessed from any other measurement menu of function group *IS 136 800 Non Signalling* using the *Modulation* hotkey. It can be opened also from the *Menu Select* main menu (with the associated key at the front of the instrument).

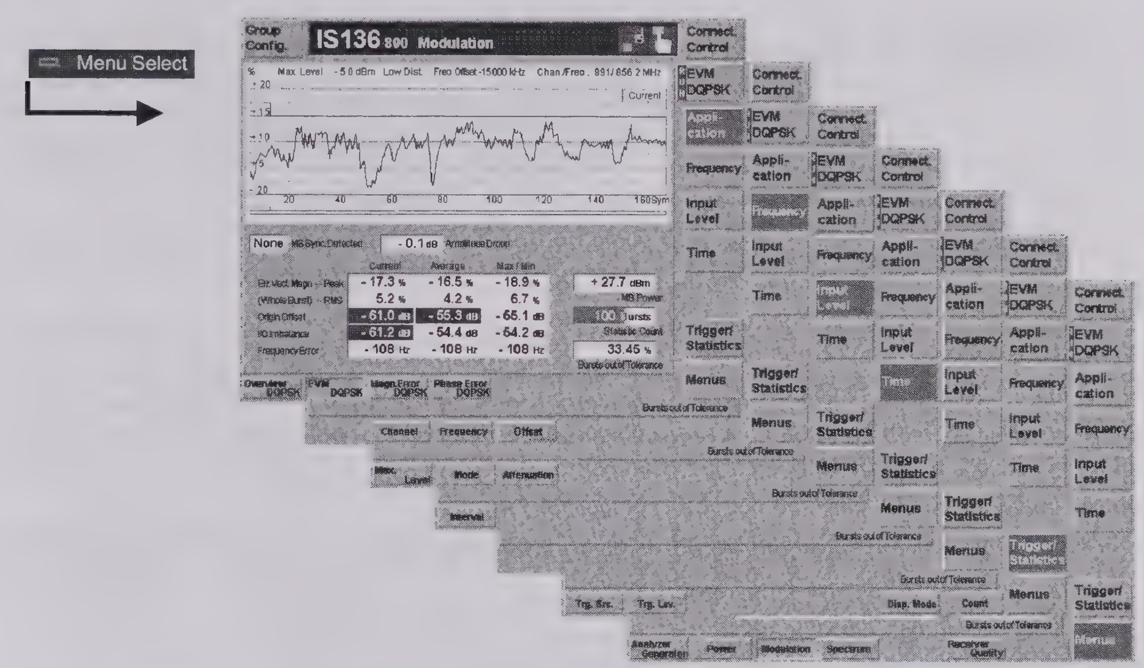

Menu Select
Group Config.
IS136 800 Modulation
Connect. Control
% Max Level -5.0 dBm Low Dist. Freq Offset -15000 kHz Chan./Freq. 991/ 856.2 MHz
Current
20
40
60
80
100
120
140
160 Sym
None MS Sync. Detected
-0.1 dB Amplitude Droop
Current
Average
Max / Min
Err. Vect. Magn. Peak
(Whole Burst) RMS
Origin Offset
IQ Imbalance
Frequency Error
+27.7 dBm
MS Power
100 Bursts
Statistic Count
33.45 %
Bursts out of Tolerance
Overview DQPSK
EVM DQPSK
Magn. Error DQPSK
Phase Error DQPSK
Application
Frequency
Input Level
Time
Trigger/ Statistics
Menus
Channel
Frequency
Offset
Max. Level
Mode
Attenuation
Interval
Trg. Src.
Trg. Lev.
Disp. Mode
Count
Analyzer Generator
Power
Modulation
Spectrum
Receiver Quality

Fig. 4-10 Measurement menu Modulation

Test Settings

The test settings for the measured *Frequency* and the *Input Level* are identical with those in menu *Power* (see section *Test Settings* on page 4.5). The *Modulation* measurement differs from the *Power* measurement in the softkeys *Application, Time,* and *Trigger/Statistics*.

Appli-cation

The *Application* softkey activates the selection of the displayed measured quantities by means of four hotkeys.

The four sets of measured quantities (applications) are displayed in different measurement menus. When an application is selected, the corresponding measurement menu is called up. The configuration settings for all applications, however, are listed in a common popup-menu (see p. 4.26 ff).

Overview DQPSK

The *Overview DQPSK* hotkey selects all scalar modulation results to be displayed. For a list of measured quantities see explanation at the beginning of this section (p. 4.17).

Remote control

No explicit switchover command. All *Overview DQPSK* measurements are identified by the 2nd/3rd level keywords `...MODulation[:OVERview]...`

Phase Error DQPSK

The *Phase Error DQPSK* hotkey selects the phase error of the modulation vector to be displayed. The phase error is the difference in phase between the measured signal from the mobile station and an ideal signal waveform at the symbol points, see explanation at the beginning of this section (p. 4.17).

Remote control

No explicit switchover command. All *Phase Error DQPSK* measurements are identified by the 2nd/3rd level keywords `...MODulation:PERRor...`

Magn. Error DQPSK

The *Magnitude Error DQPSK* hotkey selects the magnitude error of the modulation vector to be displayed. The magnitude error is the difference in magnitude between the measured signal from the mobile station and an ideal signal waveform at the symbol points, see explanation at the beginning of this section (p. 4.17). The diagram shows the relative magnitude error (in percent), i.e. the ratio of the absolute magnitude error to the magnitude of the ideal signal vector.

Remote control

No explicit switchover command. All *Magn. Error DQPSK* measurements are identified by the 2nd/3rd level keywords `...MODulation:MERRor...`

EVM DQPSK

The *EVM DQPSK* hotkey selects the magnitude of the error vector to be displayed. The error vector connects the measured signal from the mobile station and the ideal signal vector at the symbol points, see explanation at the beginning of this section (p. 4.17). The diagram shows the relative magnitude (in percent), i.e. the ratio of the magnitude of the error vector to the magnitude of the ideal signal vector.

Remote control

No explicit switchover command. All *EVM DQPSK* measurements are identified by the 2nd/3rd level keywords `...MODulation:EVMagnitude...`

Time

The *Time* softkey provides settings referring to the time axis.

Interval

The *Interval* hotkey defines an evaluation time for peak and effective results.

1st 10 Symbols	Peak and effective errors are calculated over the first ten valid symbols (symbols no. 6 to 15) of the burst.
Whole Burst	Peak and effective errors are calculated over all valid symbols (symbols no. 6 to 162) of the burst.

The standard specifies a limit for the normalized error vector magnitude during the 1st ten symbols. The CMU allows to specify different limits for all measured quantities in both time intervals, see section *Tolerance Values (Modulation Configuration – Limits)* on page 4.27.

Remote control

No explicit switchover command. The evaluation time is identified by the keywords `[:WBURst]|FTSYmbols.`

Trigger/ Statistics

The *Trigger/Statistics* softkey sets the trigger condition, the statistic mode and the number of statistics cycles.

Trg. Src.

The *Trg. Src.* hotkey defines the trigger source.

See section Trigger (Group Configuration – Trigger) on page 4.55.

Remote control

```
TRIGger[:SEQuence]:SOURce
              FRUN | RFPower | IFPower | EXTern
```

Trg. Lev.

The *Trg. Lev.* hotkey defines the trigger threshold.

This softkey is enabled for trigger source *RF Power* or *IF Power* only. See section Trigger (Group Configuration – Trigger) on page 4.55.

Remote control

```
TRIGger[:SEQuence]:THReshold LOW | MEDium | HIGH
```

Disp. Mode

The *Disp. Mode* hotkey defines the display mode.

Current	Measured value for current burst
Max./Min.	Extreme value of a number of bursts
Average	Average value of a number of bursts (with correct sign)

If the application *Error Vector Magnitude* is selected, the measured quantity is always positive or zero so that *Minimum/Maximum* is equivalent to the display of the maximum value. See section *Statistics cycles (Modulation Configuration – Statistics)* on page 4.28.

Remote control

no display mode set explicitly, the three traces are accessible via

```
FETCh:ARRAy:MODulation:<Applic>[:DQPSk]:CURRent[:RESult]?
FETCh:ARRAy:MODulation:<Applic>[:DQPSk]:MMAX[:RESult]?
FETCh:ARRAy:MODulation:<Applic>[:DQPSk]:AVERage[:RESult]? etc.
```

Scalar output lists contain the results for all three display modes.

Count

The *Count* hotkey determines the length of the statistics cycles.

1 to 1000 Bursts	Number of bursts/evaluation periods per statistics cycle,

See section *Statistics cycles (Modulation Configuration – Statistics)* on page 4.28.

Remote control

```
CONFigure:MODulation:<Applic>[:DQPSk]:CONTrol
                                   <Mode>,1 ... 1000 | OFF
```

Menus

The *Menus* softkey displays the hotkey bar for switching over to the other measurement menus.

Measurement Results

The values shown in the *Modulation* measurement menus can be divided into three groups:

- Setting values
- Scalar measurement results (single values)
- Arrays (traces plotted as a function of time)

The measurement menu for the *Overview* application shows all scalar results but no trace. The measurement menus for the remaining three applications are analogous and show the phase error, the (relative) magnitude error or the (relative) error vector magnitude as a function of time and the corresponding peak and effective values. The range and unit of the y-axis is adjusted to the measured quantity.

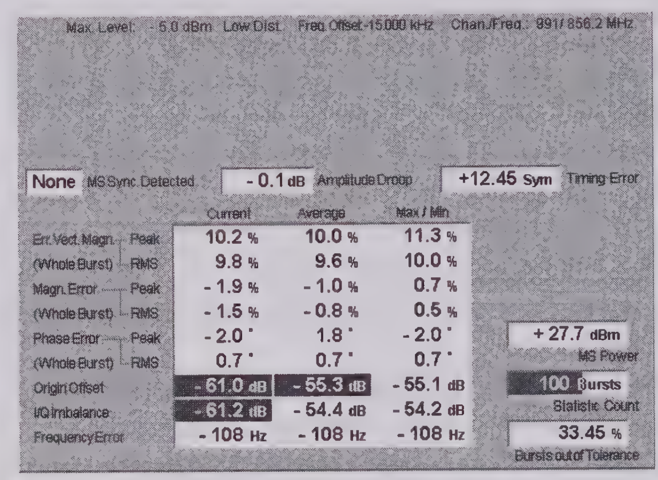
a) Scalar Results (Overview)

The measurement menu for the application *Overview DQPSK* shows all scalar results. Most of the values are indicated in tabular form:

Parameter line

Output fields

Output table
and additional fields



Max. Level: - 5.0 dBm Low Dist. Freq.Offset -15.000 kHz Chan./Freq.: 991/ 856.2 MHz

None MS Sync. Detected

- 0.1 dB Amplitude Droop

+12.45 Sym Timing Error

		Current	Average	Max / Min
Err.Vect.Magn.	Peak	10.2 %	10.0 %	11.3 %
(Whole Burst)	RMS	9.8 %	9.6 %	10.0 %
Magn.Error	Peak	- 1.9 %	- 1.0 %	0.7 %
(Whole Burst)	RMS	- 1.5 %	- 0.8 %	0.5 %
Phase Error	Peak	- 2.0 °	1.8 °	- 2.0 °
(Whole Burst)	RMS	0.7 °	0.7 °	0.7 °
Origin Offset		- 61.0 dB	- 55.3 dB	- 55.1 dB
I/Q Imbalance		- 61.2 dB	- 54.4 dB	- 54.2 dB
Frequency Error		- 108 Hz	- 108 Hz	- 108 Hz

+ 27.7 dBm MS Power

100 Bursts Statistic Count

33.45 % Bursts out of Tolerance

Fig. 4-11 Display of results (Modulation – Overview)

Parameter line The parameter line contains the following settings:

Max. Level	Maximum expected input level set as in *Input Level – Max. Level* (see section *Input Level (Group Configuration – Input Level)* on page 4.53),
Attenuation	Setting for the external attenuation of the input level *(Normal, Low Noise, Low Distortion)*,
Freq. Offset	Frequency offset with respect to the nominal channel frequency,
Chan./Freq.	RF channel and associated frequency.

Remote control The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Output fields In the three output field in the center of the menu, the following results are displayed:

MS Sync. Det.	Detected synchronization pattern of the current burst received from the mobile station *(IS 136 1* to *6* or *None)*, see section *Panel Analyzer Settings* on page 4.44).
Amplitude Droop	Difference of the signal power between the first valid symbol (symbol 6) in the current burst and the last valid symbol (symbol 162)
Timing Error	Time offset (in symbol periods) between the external trigger timing and the measured timing of the current burst. This result is available with External trigger setting only; see section *Tigger* on page 4.55.

Output table The scalar values in the output table are explained at the beginning of this section on page 4.17. They are first calculated for the current burst. From the current results the average over a statistics cycle (*Average*) and the extreme value over all bursts measured during the ongoing measurement *(Max/Min)* is calculated. Peak and

RMS[2] values are either taken over the whole useful part of the burst or over the first ten valid symbols, depending on the *Interval* setting (see p. 4.20).

Error Vect. Magn.	Peak and effective (RMS averaged) value of the error vector magnitude
Magn. Error	Peak and RMS magnitude error
Phase Error	Peak and RMS phase error
Origin Offset	Origin offset in the I/Q constellation diagram
I/Q Imbalance	Amplitude difference between the I and Q components of the measured signal
Frequency Error	Difference between measured and expected signal frequency

Additional fields Three output fields to the right of output table indicate the following results and settings:

MS Power	Average power of current burst (irrespective of the display mode selected and of the current trace). This result is obtained with a matched filter, i.e. a root-raised cosine filer specified in the standard, and therefore differs from the *MS Power* in the *Power* measurement.
Statistic Count	Length of statistics cycle in bursts. The colored bar indicates the relative measurement progress in the statistics cycle,
Bursts out of Tolerance	Percentage of bursts that violate the tolerance limits.

Limit Check A red output field and an arrow pointing upwards or downwards indicates that the measurement result exceeds the upper or lower limit set in the *Limits* tab of the *Modulation* configuration menu, see p. 4.27.

Remote control The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

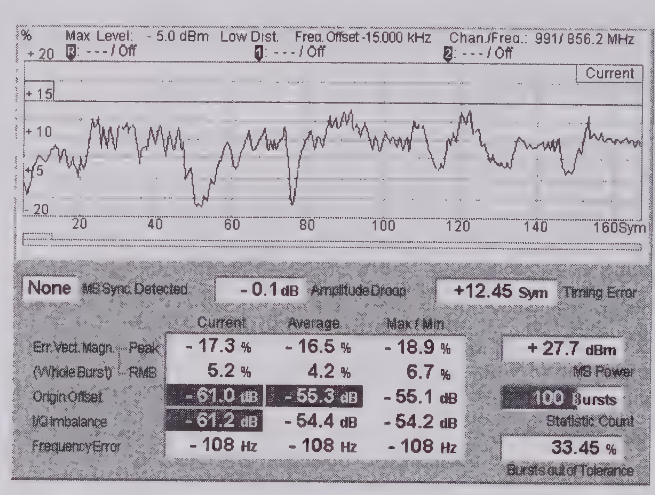
```
READ[:SCALar]:MODulation[:OVERview][:DQPSk]
                [:RESult][:WBURst]?
CALCulate[:SCALar]:MODulation[:OVERview][:DQPSk]
                [:RESult]MATCHing:LIMit[:WBURst]?
```

b) Test Diagrams (EVM, Phase Error, Magn. Error)

The graphical measurement menus for the three applications *EVM DQPSK*, *Magn. Error DQPSK*, and *Phase Error DQPSK* are analogous. The results are indicated in a parameter line, the test diagram and a tabular overview below:

---

[2] To keep the results comparable, RMS averaging was chosen for both positive quantities and quantities with alternating sign



Parameter line

Test diagram

Output fields

and table

Max Level: - 5.0 dBm Low Dist. Freq. Offset -15.000 kHz Chan./Freq.: 991/ 856.2 MHz

None MS Sync. Detected - 0.1 dB Amplitude Droop +12.45 Sym Timing Error

		Current	Average	Max / Min
Err. Vect. Magn. (Whole Burst)	Peak	- 17.3 %	- 16.5 %	- 18.9 %
	RMS	5.2 %	4.2 %	6.7 %
Origin Offset		- 61.0 dB	- 55.3 dB	- 55.1 dB
I/Q Imbalance		- 61.2 dB	- 54.4 dB	- 54.2 dB
Frequency Error		- 108 Hz	- 108 Hz	- 108 Hz

+ 27.7 dBm MS Power

100 Bursts Statistic Count

33.45 % Bursts out of Tolerance

Fig. 4-12 Display of results (Modulation – EVM / Phase Error / Magn. Error)

Settings/ Scalar results Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the output table below.

Parameter line The first parameter line contains the following settings:

Max. Level	Maximum input level set as in Input Level - Mode (see section Input Level (Group Configuration – Input Level) on page 4.53),
Attenuation	Setting for the external attenuation of the input level *(Normal, Low Noise, Low Distortion)*,
Freq. Offset	Frequency offset with respect to the nominal channel frequency,
Chan./Freq.	RF channel and associated frequency.

Remote control The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Output fields Below the diagram, the following results are displayed:

MS Sync. Det.	Detected synchronization pattern of the mobile station *(IS 136 1* to *6* or *None)*, see section *Panel Analyzer Settings* on page 4.44).
Amplitude Droop	Difference of the signal power between the first valid symbol (symbol 6) in the active slot and the last valid symbol (symbol 162)
Interval	Time interval for the calculation of peak and effective errors *(1st 10 Symbols* or *Whole Burst)*

Output table

The output table contains the following scalar values that:

MS Power	Average power of current burst (irrespective of the display mode selected and of the current trace),
Statistic Count	Length of statistics cycle in bursts. The colored bar indicates the relative measurement progress in the statistics cycle,
Bursts out of Tolerance	Percentage of bursts that violate the tolerance limits.

The following scalar values are calculated for the current burst first. From the current results the average over a statistics cycle (*Average*) and the extreme value over all bursts measured so far *(Max/Min)* is calculated:

Phase Error (Peak)	Maximum phase error
Phase Error (RMS)	Effective phase error (RMS-averaged over the burst)
Origin Offset	Origin offset in the I/Q constellation diagram
I/Q Imbalance	Amplitude difference between the I and Q components of the measured signal
Frequency Error	Difference between measured and expected signal frequency

Peak and RMS values refer to the current application *(Phase Error, Magnitude Error* or *Error Vector Magnitude)*. For an explanation of all quantities measured refer to the beginning of this section on page 4.17.

Limit Check

A red output field and an arrow pointing upwards or downwards indicates that the measurement result exceeds the upper or lower limit set in the *Limits* tab of the *TX Tests* configuration menu, see p. 4.27.

Remote control

```
READ[:SCALar]:MODulation:<Applic>[:DQPSk][:RESult][:WBURst]?
```

etc.

```
CALCulate[:SCALar]:MODulation:<Applic>[:DQPSk][:RESult]
   :MATChing:LIMit[:WBURst]?
```

Traces (arrays)

The continuous trace in the test diagram shows the measured quantity as a function of time (in symbols). The display mode *(Current, Max./Min., Average)* for the trace is indicated in the upper right corner of the diagram.

The trace comprises the whole useful part of the normal burst (symbol 6 to 162). The y-axis range is fixed for any of the three measured quantities (applications):

–20 deg to +20 deg	for the phase error
–20 % to +20 %	for the magnitude error
0 % to +20 %	for the error vector magnitude

The two colored, horizontal lines in the test diagram mark the selected tolerance range of the phase error.

Limit Check

The upper and lower limit lines for each test point defined in the *Limit Lines* tab of the configuration menu (see p. 4.27) yield the two red step functions in the diagram. If the limit check fails at a particular test point the corresponding section of the red bar across the bottom of the diagram is shifted upwards.

Remote control

```
READ:ARRay:MODulation:<Applic>[:DQPSk]:CURRent[:RESult]?
```

etc.

Measurement Configurations (Modulation Configuration)

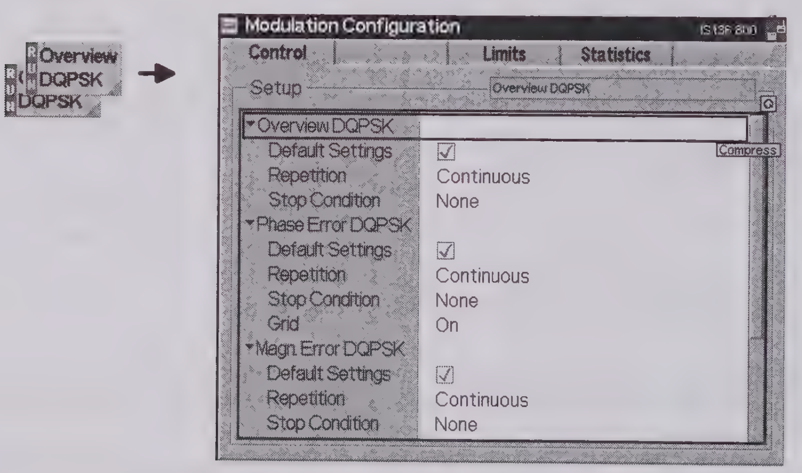
The popup menu *Modulation Configuration* contains three tabs which determine the parameters of the *Modulation* measurement including the error tolerances.

The popup menu *Modulation Configuration* is activated by pressing the main softkey in the top right of the graphical measurement menu *Modulation* (this softkey reads *Overview, Phase Error, Magnitude Error* or *Err. Vector Magnitude*, depending on the selected application) twice. By pressing the associated hotkeys, it is possible to change between the tabs.

Measurement Control (Modulation Configuration – Control)

The tab *Control* controls the *Modulation* measurement by defining

- the *Repetition* mode,
- the *Stop Condition* for the measurement.
- Besides, it influences the measurement diagram by adding a *Grid* or not.



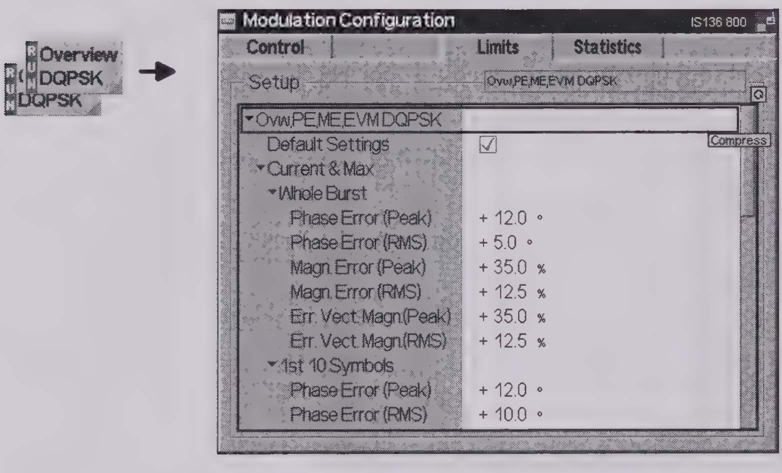
▾Overview DQPSK
Default Settings ☑
Repetition Continuous
Stop Condition None
▾Phase Error DQPSK
Default Settings ☑
Repetition Continuous
Stop Condition None
Grid On
▾Magn. Error DQPSK
Default Settings ☑
Repetition Continuous
Stop Condition None

Fig. 4-13 Modulation Configuration – Control

All settings can be defined separately for the three applications *Phase Error, Magnitude Error*, and *Error Vector Magnitude*. They comply with those of the menu *Control* in the menu group *Power* (see page 4.11). In the remote-control commands, the keywords `POWer:<Applic>` are to be replaced by `MODulation:<Applic>`.

Tolerance Values (Modulation Configuration – Limits)

The tab *Limits* defines upper and lower error limits for the results obtained in the *Modulation* measurement. All relevant quantities are explained at the beginning of section *Modulation Measurements* on page 4.17.



Setup: Ovw,PE,ME,EVM DQPSK

- Ovw,PE,ME,EVM DQPSK
  - Default Settings ☑
  - Current & Max
    - Whole Burst
      - Phase Error (Peak) + 12.0 °
      - Phase Error (RMS) + 5.0 °
      - Magn. Error (Peak) + 35.0 %
      - Magn. Error (RMS) + 12.5 %
      - Err. Vect. Magn.(Peak) + 35.0 %
      - Err. Vect. Magn.(RMS) + 12.5 %
    - 1st 10 Symbols
      - Phase Error (Peak) + 12.0 °
      - Phase Error (RMS) + 10.0 °

Fig. 4-14 Modulation Configuration – Limits

Ovw., EVM, ME, PE, DQPSK

The *Ovw., EVM, ME, PE, DQPSK* table section defines all limits for π/4 DQPSK-modulated signals. The limits are set independently for the display modes *Current* and *Max./Min.* on one hand, *Average* on the other hand; see section Statistics cycles (Modulation Configuration – Statistics) on page 4.28 ff. Furthermore, the peak and RMS values of the arrays *Error Vector Magnitude*, *Magnitude Error* and *Phase Error* can be assessed in a time interval comprising the first 10 valid symbols (symbols 6 to 15) or over the whole useful part of the burst (symbols 6 to 162).

Default Settings	Overwrites all *DQPSK settings* with their default values (see command description in Chapter 6)
Error Vector Magn.	Upper limits for the (peak or RMS-averaged[3]) error vector magnitude (EVM). Both entries are positive.
Magnitude Error	Upper limits for the absolute value of the (peak or RMS) magnitude error. Both entries are positive; the limits for the peak magnitude error define a tolerance mask symmetric to the origin.
Phase Error	Upper limits for the absolute value of the (peak or RMS) phase error. Both entries are positive; the limits for the peak phase error define a tolerance mask symmetric to the origin.
Origin Offset	Upper limit for the origin offset in the I/Q constellation diagram.
I/Q Imbalance	Upper limit for the amplitude difference between the in-phase and quadrature components of the signal.
Frequency Error	Upper limit for the difference between the measured and the expected frequency of the signal.

For an explanation of all measured quantities refer to the beginning of this section on page 4.17.

Remote control

```
CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit[:WBURst]...
CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit:FTSYmbols...
CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit[:WBURst]...
CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit:FTSYmbols...
```

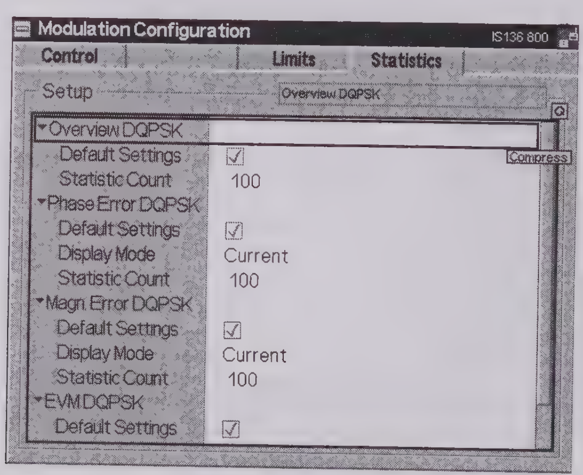
---

[3] To keep the results comparable, RMS averaging was chosen for both positive quantities and quantities with alternating sign.

Statistics cycles (Modulation Configuration – Statistics)

The tab *Statistics* defines the number of bursts forming a statistics cycle and the displayed trace *(Display Mode)*. The *Display Mode* is not applicable for the *Overview* application. Besides, all settings can be defined separately for the four applications *Overview*, *Phase Error, Magnitude Error*, and *Error Vector Magnitude*.

Overview
DQPSK
DQPSK



- Overview DQPSK
  - Default Settings ☑
  - Statistic Count 100
- Phase Error DQPSK
  - Default Settings ☑
  - Display Mode Current
  - Statistic Count 100
- Magn. Error DQPSK
  - Default Settings ☑
  - Display Mode Current
  - Statistic Count 100
- EVM DQPSK
  - Default Settings ☑

Fig. 4-15 Modulation Configuration – Limits

Display Mode The *Display Mode* field defines which of the measured and calculated traces is displayed. The traces differ in the way the measured quantity *Q(t)* at a fixed point in time *t* is calculated if the measurement extends over several bursts

Current	Measured value for current burst
Max./Min.	Extreme value of a number of bursts (with correct sign)
Average	Average value of a number of bursts

The number of bursts for the calculation of the statistical values *Max./Min.* and *Average* – and thus the result – depends on the set measurement mode (see section *Measurement Control (Power Configuration – Control)* on page 4.11). In detail, this implies:

Single shot	Display of minimum, maximum and average value from the performed statistics cycle,
Continuous	Display of minimum and maximum from all bursts already measured. The **average value**, however, refers to the last statistics cycle that has been performed.

In a power measurement absolute values are determined, whereas the measured phase error can have both positive or negative sign. To assess the phase error only the magnitude (and not the sign) is of importance so that extreme values are output in the menu *Modulation* instead of maxima and minima.

Remote control

no display mode set explicitly, the three traces are accessible via

`FETCh:ARRAy:MODulation:<Applic>[:DQPSk]:CURRent[:RESult]?`
`FETCh:ARRAy:MODulation:<Applic>[:DQPSk]:MMAX[:RESult]?`
`FETCh:ARRAy:MODulation:<Applic>[:DQPSk]:AVERage[:RESult]?` etc.

Scalar output lists contain the results for all three display modes.

Statistic Count	The input field *Statistic Count* defines the number of bursts forming a statistics cycle. *1 to 1000 Bursts* Number of bursts per statistics cycle, A statistics cycle is equal to the duration of a single shot (see section *Measurement Control (Power Configuration – Control)* on page 4.11).
Remote control	`CONFigure:MODulation:<Applic>[:DQPSk]:CONTrol <MODE>,1 ... 1000 | OFF`

Adjacent Channel Power Measurements

The menu group *Spectrum* comprises the functions for measurement of the adjacent channel power (ACP) which can be measured and plotted either in the frequency or in the time domain. The measurement results are displayed in the graphical measurement menu *Spectrum,* the popup menu *Spectrum Configuration* is used for configuration of the measurements.

The adjacent channel measurement serves to measure the amount of energy that spills outside the designated radio channel. According to the prescription of the standard, the measurement is made at ±30 kHz from the nominal frequency of the designated channel (adjacent channels), at ±60 kHz (1st alternate channels), and at ±90 kHz (2nd alternate channels, see Fig. 4-16). The CMU uses a passband filter (described in the standard) to eliminate interference from unwanted sources.

There are two different types radiation to be covered by the ACP measurement:

- The out-of-band power originating from the modulation and noise can be assessed by the average off-carrier power. The average power measurement is made using 50% of the symbol periods in one time slot of the active channel.
- The out-of-band power originating from the switching transients (caused by the ramping-on and ramping-off of the transmitter) can be assessed by the measured peak power values.

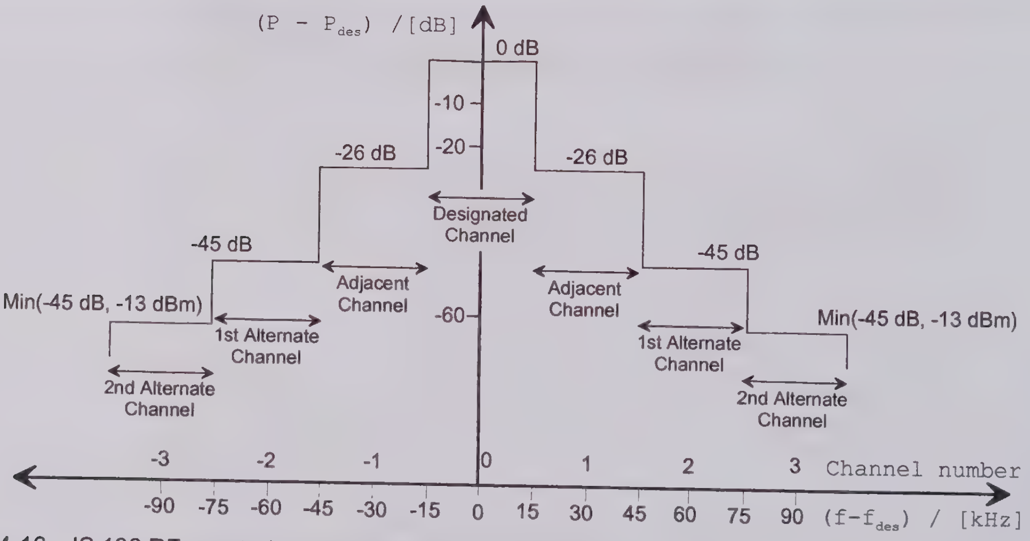

(P - P_des) / [dB]
0 dB
-10
-20
-60
-26 dB
-26 dB
-45 dB
-45 dB
Min(-45 dB, -13 dBm)
Min(-45 dB, -13 dBm)
Designated Channel
Adjacent Channel
Adjacent Channel
1st Alternate Channel
1st Alternate Channel
2nd Alternate Channel
2nd Alternate Channel
-3 -2 -1 0 1 2 3 Channel number
-90 -75 -60 -45 -30 -15 0 15 30 45 60 75 90 (f-f_des) / [kHz]

Fig. 4-16 IS 136 RF spectral mask centered on the frequency of the designated channel f_{des}

The spectral mask shown in Fig. 4-16 applies to both the peak power and average power measurement. A typical example of a waveform due to a burst as seen in a 60 kHz offset from the carrier (1st alternate channel) is given below (Fig. 4-17):

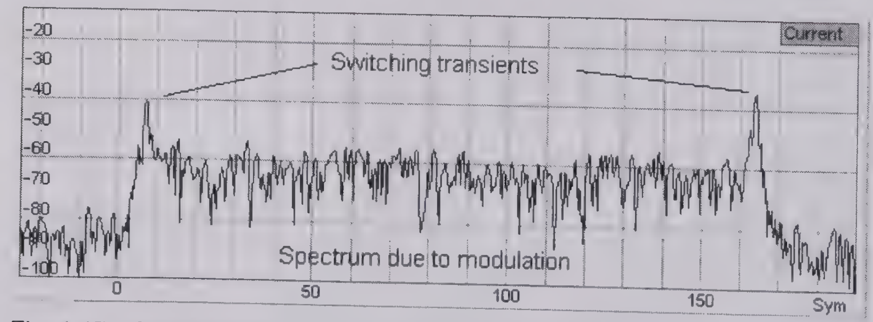


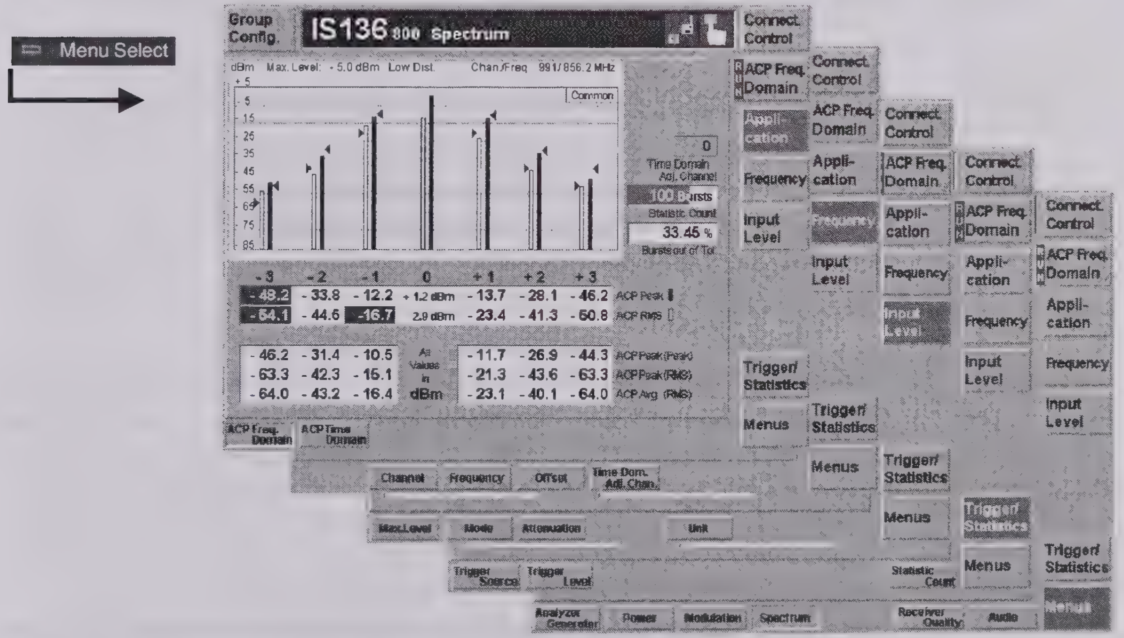
Fig. 4-17 Spectrum due to modulation and switching transients in time domain representation

Measurement Menu (Spectrum)

The graphical measurement menu *Spectrum* displays the results of the adjacent channel power measurement.

- The main softkey *ACP Freq. Domain* (which changes to *ACP Time Domain* if that application is selected) indicates the measurement status *(RUN | HLT | OFF)* and opens the configuration menu *Spectrum Configuration*
- The softkeys *Application, Frequency, Input Level, Trigger/Statistics and Menus* to the right of the test diagram are combined with various hotkeys. If a softkey is selected and an associated hotkey pressed, a popup window will appear, which indicates a setting or enables an entry (see section *Measurement Menu (Power)* on page 4.4).

The measurement menu *Spectrum* can be accessed from any other measurement menu of function group *IS 136 800 Non Signalling* using the *Spectrum* hotkey. It can be opened also from the *Menu Select* main menu (with the associated key at the front of the instrument).


Menu Select
Group Config.
IS136 800 Spectrum
Connect. Control
dBm Max. Level: - 5.0 dBm Low Dist. Chan./Freq 991/856.2 MHz
Common
Time Domain Adj. Channel
100 Bursts
Statistic Count
Bursts out of Tol.
ACP Freq. Domain
Appli- cation
Frequency
Input Level
Trigger/ Statistics
Menus
ACP Time Domain
Channel
Frequency
Offset
Time Dom. Adj. Chan.
Max.Level
Mode
Attenuation
Unit
Trigger Source
Trigger Level
Statistic Count
Analyzer Generator
Power
Modulation
Spectrum
Receiver Quality
Audio

-3	-2	-1	0	+1	+2	+3	
-48.2	-33.8	-12.2	+1.2 dBm	-13.7	-28.1	-46.2	ACP Peak
-64.1	-44.6	-16.7	2.9 dBm	-23.4	-41.3	-60.8	ACP RMS
-46.2	-31.4	-10.5	All Values in dBm	-11.7	-26.9	-44.3	ACP Peak (Peak)
-63.3	-42.3	-15.1		-21.3	-43.6	-63.3	ACP Peak (RMS)
-64.0	-43.2	-16.4		-23.1	-40.1	-64.0	ACP Avg (RMS)

0

33.45 %

Fig. 4-18 Measurement menu Spectrum

Test Settings

The *Marker* (for time-domain representation), *Trigger/Statistics,* and *Menu* settings are identical with those in menu *Power* (see section *Test Settings* on page 4.5, no display mode can be set for frequency-domain representation). The *Spectrum* measurement differs from the *Power* measurement in the softkeys *Application, Frequency,* and *Input Level.*

Appli- cation

The *Application* softkey activates the selection of the display range for the adjacent channel power by means of two hotkeys.

The two alternative diagrams (applications) are displayed in different measurement menus. When an application is selected, the corresponding measurement menu is called up. The configuration settings for both applications, however, are listed in a common popup-menu (see p. 4.26 ff).

ACP Freq. Domain The *ACP Freq. Domain* hotkey selects the frequency-domain measurement where the ACP is displayed as a function of the frequency. In this mode, the peak and average power of the traffic channel, the adjacent channel and the first and second alternate channel (p. 4.17) are plotted in a single bar graph.

Remote control No explicit switchover command. All *ACP Freq. Domain* measurements are identified by the 2nd/3rd/4th level keywords `...SPECtrum[:ACPower][:FDOMain]...`

ACP Time Domain The *ACP Time Domain* hotkey selects the time-domain measurement where the ACP of a particular adjacent or alternate channel is displayed as a function of time.

Remote control No explicit switchover command. All *ACP Time Domain* measurements are identified by the 2nd/3rd/4th level keywords `...SPECtrum[:ACPower][:TDOMain]...`

Frequency The *Frequency* softkey activates the frequency of the RF signal analyzed.

Frequency The *Frequency* hotkey defines the carrier frequency in MHz.

See section *Control of Input and Output Signals (Connection Control – Signal)*, Panel *Analyzer Settings* on page 4.43.

Remote control `[SENSe:]RFANalyzer:FREQuency <FREQuency>`

Channel The *Channel* hotkey defines the channel number.

See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.43.

Remote control
```
[SENSe:]RFANalyzer:FREQuency:UNIT CH
[SENSe:]RFANalyzer:FREQuency <CH_Number>
```

Offset The *Offset* hotkey defines an offset for the RF carrier frequency.

See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.43.

Remote control `[SENSe:]RFANalyzer:FREQuency:OFFSet <Offset>`

Time Domain Adj. Chan. The *Time Domain Adj. Chan.* hotkey defines the channel for the time-domain ACP measurement. Numbers –3 to +3 may be selected, corresponding to the designated channel, the adjacent channels, and the first and second alternate channels (see Fig. 4-16).

Input Level The *Input Level* softkey sets the input level parameters.

Max. Level The *Max. Level* hotkey determines the maximum expected input level in dBm.

See section *Input Level (Group Configuration – Input Level)* on page 4.53.

Remote control `[SENSE:]LEVel:MAXimum  <Level>`

Attenuation	The *Attenuation* hotkey selects a strategy for tuning the RF analyzer.

Normal	Input signal is kept unchanged
Low Noise	Enhanced mixer level. This setting ensures the full dynamic range of the CMU and is therefore recommended for *Power* vs time and *Spectrum* measurements.
Low Distortion	Decreased mixer level. This setting ensures a high transmission reserve and is therefore recommended for *Modulation* measurements.

See section *Input Level (Group Configuration – Input Level)* on page 4.53.

Remote control `[SENSE:]LEVel:ATTenuation NORMal | LNOIse | LDIStortion`

Ref. Level The *Ref. Level* hotkey shifts the reference level in the ACP time domain diagram.

The scale and range of the y-axis in the measurement diagram is not affected.

Remote control No command, screen configuration only.

Unit The *Unit* hotkey sets the display unit for scalar results.

It is possible to select absolute (dBm) or relative units (dBc). The units refer to the scalar measurement results displayed in the tables below the diagram; the measurement diagram itself is not affected.

Remote control No command, screen configuration only.

Measurement Results

The *Spectrum* menu group contains two separate measurement menus corresponding to the two applications *ACP Freq. Domain* and *ACP Time Domain*. These menus show different test diagrams and measured quantities.

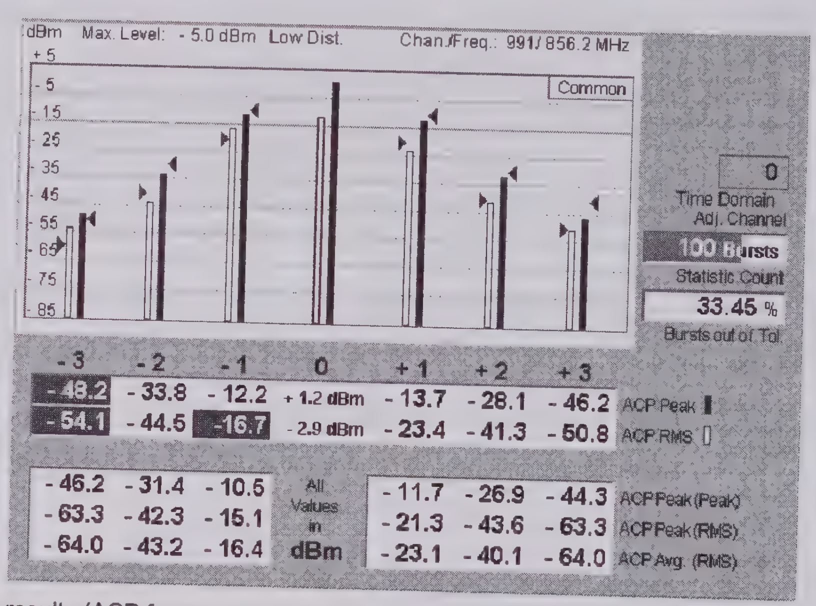
a) ACP Frequency Domain Measurement

In the *ACP Freq. Domain* measurement, the (peak and effective) burst power in the designated channel, the adjacent channels, 1st and 2nd alternate channels is displayed. These results and the corresponding measurement settings are indicated in two parameter lines, the test diagram (bar graph) and a tabular overview below:

Parameter lines

Bar graph and Output fields

Output tables



dBm Max. Level: - 5.0 dBm Low Dist. Chan./Freq.: 991/856.2 MHz

Time Domain Adj. Channel: 0

Statistic Count: 100 Bursts

Bursts out of Tol.: 33.45 %

- 3	- 2	- 1	0	+ 1	+ 2	+ 3	
- 48.2	- 33.8	- 12.2	+ 1.2 dBm	- 13.7	- 28.1	- 46.2	ACP Peak ▮
- 54.1	- 44.5	- 16.7	- 2.9 dBm	- 23.4	- 41.3	- 50.8	ACP RMS ▯

- 46.2	- 31.4	- 10.5	All Values in dBm	- 11.7	- 26.9	- 44.3	ACP Peak (Peak)
- 63.3	- 42.3	- 15.1		- 21.3	- 43.6	- 63.3	ACP Peak (RMS)
- 64.0	- 43.2	- 16.4		- 23.1	- 40.1	- 64.0	ACP Avg. (RMS)

Fig. 4-19 Display of results (ACP frequency domain)

Parameter lines The first parameter line contains the following settings:

Max. Level	Maximum input level as set in *Input Level – Max. Level* (see section Input Level (Group Configuration – Input Level) on page 4.53)
Attenuation	Setting for the external attenuation of the input level *(Normal, Low Noise, Low Distortion)*
Chan./Freq.	RF channel and associated frequency

Output fields To the right of the diagram, the following settings are displayed:

Time Domain Adj. Channel	Channel selected for application *ACP Time Domain* (see Fig. 4-16). This setting has no influence on the frequency-domain diagram.
Statistic Count	Length of statistics cycle in bursts. The colored bar indicates the relative measurement progress in the statistics cycle
Bursts out of Tolerance	Percentage of bursts that violate the tolerance limits

Remote control The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Bar graph The bar graph shows the current *ACP Peak* (solid bars, switching transients) and *ACP RMS* values (contour bars, modulation contributions) in channels no. –3 to +3 (see output table below). The red triangles indicate the upper limits for both quantities as set in the *Spectrum Configuration – Limits* menu (see p. 4.38).

Output table The upper output table contains the following scalar values:

ACP Peak/RMS	Maximum/effective power of current burst (irrespective of the display mode selected and of the current trace) in channels no. –3 to +3. All results are expressed in absolute units (dBm).

The *ACP Peak* and *ACP RMS* values are calculated and stored for all bursts measured. From these values the average over a statistics cycle *(RMS)* and the peak value over all bursts measured so far *(Peak)* is calculated:

ACP Peak (Peak)	Maximum of all *ACP Peak* values in the measurement (=maximum power ever measured)
ACP Peak (RMS)	Maximum of all *ACP RMS* values in the measurement
ACP Avg. (RMS)	Average of all *ACP RMS* values in the last statistics cycle

These statistical results can be expressed either in absolute (dBm) or in relative units (dBc); see *Input Level – Unit* hotkey.

Limit Check A red output field and an arrow pointing upwards/downwards indicates that the measurement result exceeds the upper/lower limit set in the *Limits* tab of the *Spectrum* configuration menu, see p. 4.38.

Remote control

```
READ[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?
FETCh[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?
SAMPle[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?
CALCulate[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]
                           :MATChing:LIMit?
```

b) ACP Time Domain Measurement

In the ACP Frequency domain measurement, the burst power in a particular (adjacent) channel is plotted as a function of time. The values shown in the *Spectrum* measurement menu can be divided into three groups:

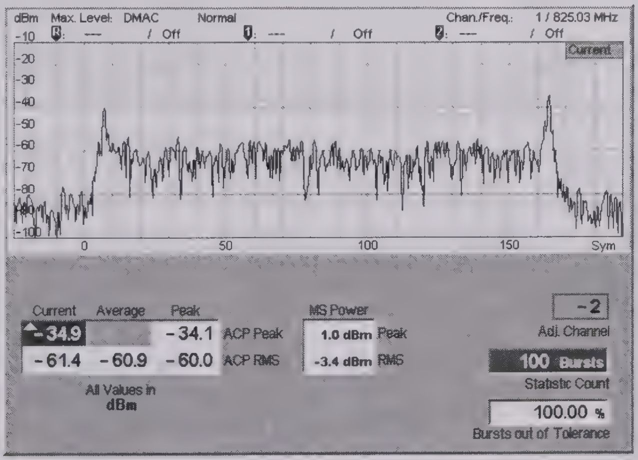
- Setting values
- Scalar measurement results (single values)
- Arrays (trace representing the burst power as a function of time)

They are indicated in two parameter lines, the test diagram and a tabular overview below:

Parameter lines

Test diagram

Output fields



dBm Max. Level: DMAC Normal Chan./Freq.: 1 / 825.03 MHz

R: --- / Off 1: --- / Off 2: --- / Off

Current Average Peak

-34.9 -34.1 ACP Peak

-61.4 -60.9 -60.0 ACP RMS

All Values in dBm

MS Power

1.0 dBm Peak

-3.4 dBm RMS

-2 Adj. Channel

100 Bursts Statistic Count

100.00 % Bursts out of Tolerance

Fig. 4-20 Display of results (ACP time domain)

Settings/ Results Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the output table below.

1st Parameter line The first parameter line contains the following settings:

Max. Level	Maximum input level set as in *Input Level - Mode* (see section Input Level (Group Configuration – Input Level) on page 4.53)

Attenuation	Setting for the external attenuation of the input level *(Normal, Low Noise, Low Distortion)*
Freq. Offset	Frequency offset with respect to the nominal channel frequency
Chan./Freq.	RF channel and associated frequency

2nd parameter line

The second parameter line contains the following marker values:

R	Level and time of reference marker
1	Level and time of delta marker 1 (setting *absolute*) or difference from reference marker (setting *relative*)
2	Level and time of delta marker 2 (setting *absolute*) or difference from reference marker (setting *relative*)

Output fields

Below the diagram, the following settings are displayed:

Adj. Channel	Current adjacent channel number according to Fig. 4-16.
Statistic Count	Length of statistics cycle in bursts. The colored bar indicates the relative measurement progress in the statistics cycle.
Bursts out of Tolerance	Percentage of bursts measured that violate the tolerance limits.

Remote control

The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Output table

The maximum and effective burst power (*ACP Peak* and *ACP RMS)* is calculated and stored for all bursts measured. The output table shows the results for the current burst, the average over a statistics cycle (*Average*) and the peak value over all bursts measured so far *(Peak)*:

Current	Maximum and average burst power (*ACP Peak* and *ACP RMS)* of the current burst,
Average	Average of the *ACP RMS* values in the last statistics cycle,
Peak	Maximum of all *ACP Peak* and *ACP RMS* values in the current measurement.

These statistical results can be expressed in absolute (dBm) or relative units (dBc), see *Input Level – Unit* hotkey.

In addition, the maximum and average power of the current designated burst (channel 0) is indicated in dBm (output table *MS Power*).

Limit Check

A limit is specified for the peak and effective values of the adjacent channel powers. The limit check is thus included in the limit check for the *ACP Time Domain* measurement.

Remote control

`READ:ARRay:SPECtrum[:ACPower]:TDOMain]:CURRent[:RESult]?` etc.

Measurement Configurations (Spectrum)

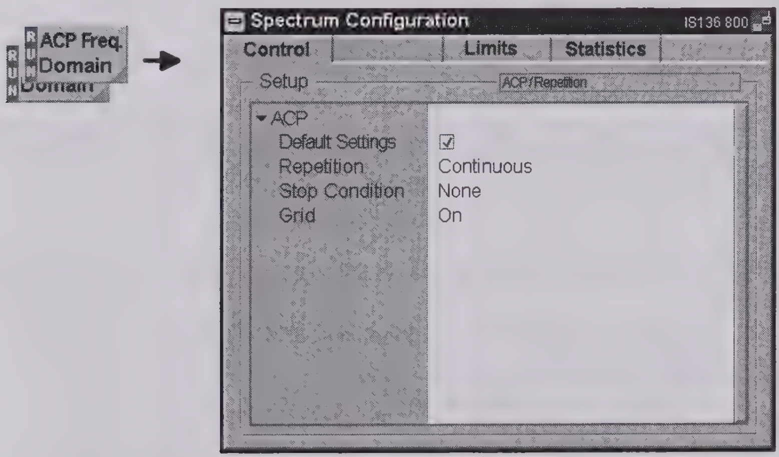
The popup menu *Spectrum Configuration* contains three tabs which define the parameters of the ACP power measurement including the error tolerances.

The popup menu *Spectrum Configuration* is called up by pressing the main softkey in the top right of the graphical measurement menu *Spectrum* twice (this softkey reads *ACP Freq. Domain* or *ACP Time Domain*, depending on the selected application). By pressing the associated hotkeys, it is possible to change between the tabs.

Measurement Control (Spectrum Configuration – Control)

The tab *Control* controls the ACP measurement by defining

- the *Repetition* mode,
- the *Stop Condition* for the measurement.
- Besides, it influences the measurement diagram by adding a *Grid* or not.



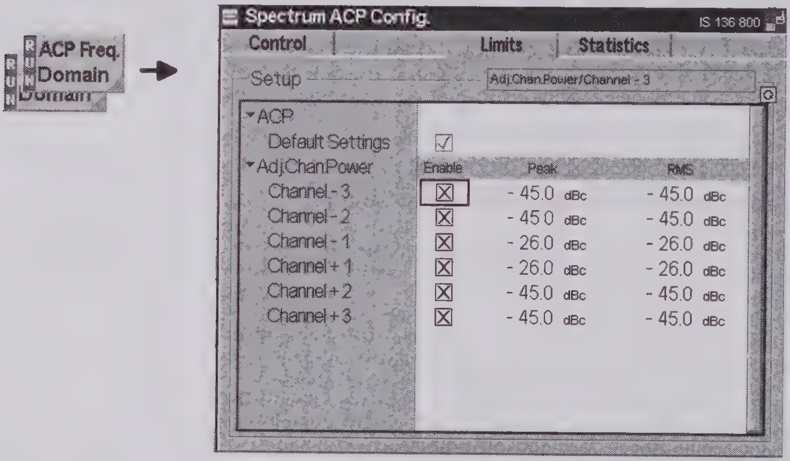
Default Settings ☑
Repetition Continuous
Stop Condition None
Grid On

Fig. 4-21 Modulation Configuration – Control

All settings comply with those of the menu *Control* in the menu group *Power* (see page 4.11). In the remote-control commands, the keywords `POWer:<Applic>` are to be replaced by `SPECtrum:<Applic>`.

Tolerance Values (Spectrum Configuration – Limits)

The tab *Limits* defines upper limits for the maximum and effective power in the adjacent channels and in the first and second alternate channels (–3 to –1, 1 to 3, see Fig. 4-16).



ACP
Default Settings ☑
Adj.Chan.Power

	Enable	Peak	RMS
Channel - 3	☒	- 45.0 dBc	- 45.0 dBc
Channel - 2	☒	- 45.0 dBc	- 45.0 dBc
Channel - 1	☒	- 26.0 dBc	- 26.0 dBc
Channel + 1	☒	- 26.0 dBc	- 26.0 dBc
Channel + 2	☒	- 45.0 dBc	- 45.0 dBc
Channel + 3	☒	- 45.0 dBc	- 45.0 dBc

Fig. 4-22 Spectrum Configuration – Limits

Default Settings	The *Default Settings* switch applies default power limits to all channels. See command description in chapter 6.
Remote control	`CONFigure:SPECtrum[:ACPower]:LIMit:DEFault ON | OFF`
Adj. Chan. Power	The *Adj. Chan. Power* table section defines upper limits for the peak and RMS channel power:

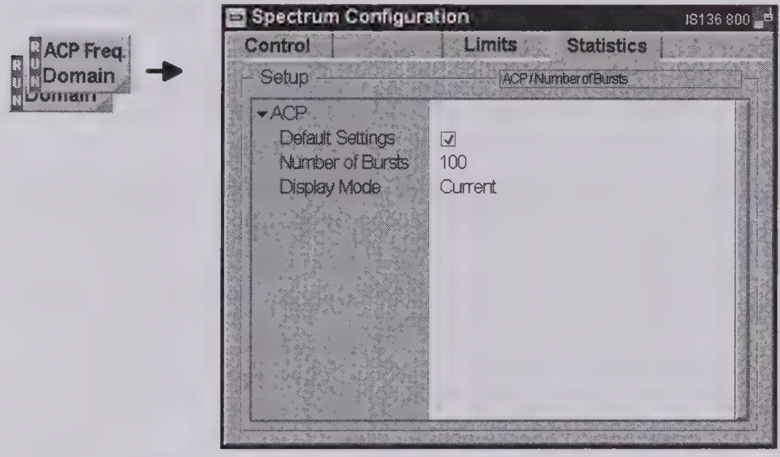
Enable	Switches the limit check in the corresponding channel on and off
Peak	Upper limit for the maximum channel power
RMS	Upper limit for the effective channel power

Remote control

```
CONFigure:SPECtrum[:ACPower]:LIMit:CHN<nr> ON | OFF
CONFigure:SPECtrum[:ACPower]:LIMit:CHN<nr>
                                 <LevPeak>, <LevRMS>, <Enable>
CONFigure:SPECtrum[:ACPower]:LIMit:CHP<nr> ON | OFF
CONFigure:SPECtrum[:ACPower]:LIMit:CHP<nr>
                                 <LevPeak>, <LevRMS>, <Enable>
```

Statistics (Modulation Configuration – Statistics)

The tab *Statistics* defines the number of bursts forming a statistics cycle and the displayed power spectrum or power ramp *(Display Mode)*.


RUN
ACP Freq. Domain
Spectrum Configuration
IS136 800
Control
Limits
Statistics
Setup
ACP / Number of Bursts
ACP

Default Settings ☑
Number of Bursts 100
Display Mode Current

Fig. 4-23 Modulation Configuration – Limits

All settings apply to both applications *ACP Time Domain* and *ACP Frequency Domain*. They comply with those of the menu *Control* in the menu group *Power* (see page 4.11). In the remote-control commands, the keywords `POWer:<Applic>` are to be replaced by `SPECtrum:<Applic>`.

Receiver Quality Measurements

The menu group *Receiver Quality* measures parameters that describe the sensitivity of the mobile station receiver, in particular at low RF power levels.

The popup menu *Receiver Quality Configuration* is used for configuration of the measurements; the measurement results are indicated in the main menu *Receiver Quality*.

Note: *The evaluation of the quality of transmission is based on the bit for bit comparison of the signal transmitted by the CMU with the signal received, decoded, and returned by the mobile station.*

Therefore, in Non Signalling *mode, the mobile phone must be manually set to the loop back mode where it returns the signal received from the CMU unchanged. If this is not done, the tests will measure large error rates.*

In addition, the RF generator must be set to generate a BER Test Signal, *see description of softkey* RF Signal Type *on page* 4.48.

Measured quantities The bit error rate *(BER)* is the ratio of bit errors to the total number of transferred bits in percent:

BER = bit errors / total number of bits * 100%
= bit errors / (bits per frame * frames transmitted)* 100%

The CMU evaluates "raw" data field bits with no correction (i.e., before channel decoding). The basic evaluation period in the *Receiver Quality* measurement is the TDMA *frame* with a length of 40 ms and a data content of 520 bits (for a full-rate speech channel occupying 2 timeslots).

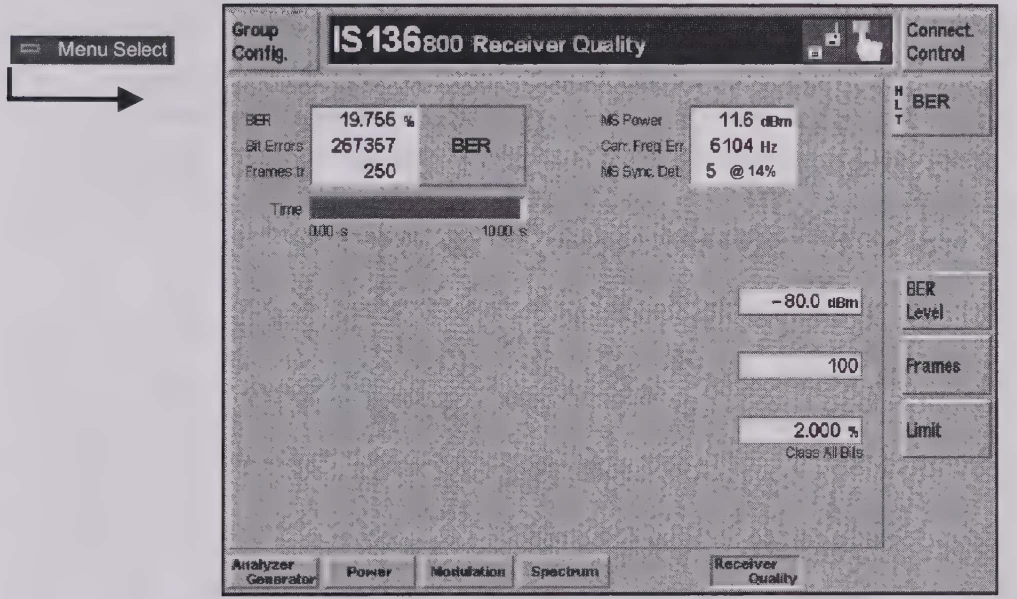
The *Receiver Quality* measurement is always performed in *Single Shot* mode and extends over a definite number of frames.

Measurement Menu (Receiver Quality)

The *Receiver Quality* menu shows the results and the most important parameters of the bit error rate test.

- The main softkey *BER* controls the *Receiver Quality* test and indicates its status *(RUN | HLT | OFF).*
- The remaining softkeys define the RF signal level at which the bit error rate is evaluated *(BER Level),* the scope of the measurement *(Frames)* and an upper limit for the measurement result *(Limit).*
- The measurement results and a progress bar are shown in the upper part of the *Receiver Quality* menu.
- An additional tableindicates the mobile transmitter characteristics.

The measurement menu *Receiver Quality* can be accessed from any other measurement menu of function group *IS 136 800 Non Signalling* using the *Receiver Quality* hotkey. It can be opened also from the *Menu Select* main menu (with the associated key at the front of the instrument).


Menu Select
Group Config.
IS 136 800 Receiver Quality
Connect. Control
HLT BER
BER Level
Frames
Limit
Analyzer Generator
Power
Modulation
Spectrum
Receiver Quality
Time
0.00 s
10.00 s

BER 19.756 %
Bit Errors 267357
Frames tr 250
BER

MS Power 11.6 dBm
Carr. Freq Err. 6104 Hz
MS Sync. Det. 5 @ 14%

−80.0 dBm
100
2.000 %
Class All Bits

Fig. 4-24 Main menu Receiver Quality

Test Settings

The single shot BER test is configured by means of three softkeys located on the right softkey bar:

BER Level

The *BER Level* softkey defines the generator level in dBm at which the bit error rate test is performed.

Remote control `CONFigure:RXQuality:BER:CONTrol:TSETup1[:DTC]:LEVel <Level>`

Frames

The *Frames* softkey defines number of frames that form a statistics cycle.

In the context of *Receiver Quality* measurements, *Frame* denotes a TDMA frame comprising 2x260 speech data bits (for a full-rate speech channel occupying two timeslots). A statistics cycle is equal to the duration of a single shot measurement which is not stopped explicitly or by an error condition.

Remote control `CONFigure:RXQuality:BER:CONTrol:TSETup1:FRAMes <Frames>`

Limit

The *Limit* softkey defines an upper limit (in percent) for the bit error rate.

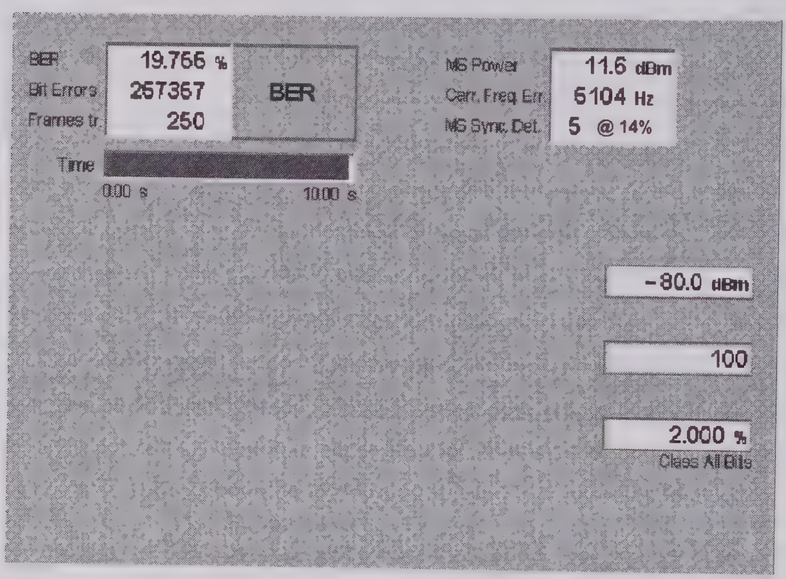
If the measured bit error rate exceeds the limit, the output field turns red with a white triangle pointing upwards.

Remote control `CONFigure:RXQuality:BER:LIMit:TSETup1:ABITs <Limit>`

Measurement Results

The values shown in the measurement menu *Receiver Quality* can be divided into two groups:

- Measurement results and the progress of the measurement are displayed in the left half of the menu.
- The mobile transmitter characteristics are indicated in the right half.



BER 19.766 %
Bit Errors 257367
Frames tr. 250
BER
Time
0.00 s 10.00 s
MS Power 11.6 dBm
Carr. Freq Err. 5104 Hz
MS Sync. Det. 5 @ 14%
-80.0 dBm
100
2.000 %
Class All Bits

Fig. 4-25 Display of measurement results (Receiver Quality)

Measurement results The results of the Receiver Quality measurement are shown in the two tables in the upper half of the measurement menu.

BER table The left-hand table contains the current measured bit error rate and the statistics of the measurement:

BER	Current bit error rate,
Bit Errors	Number of bit errors detected in the current measurement,
Frames tr.	Number of frames transmitted in the current measurement.

Mobile transmitter characteristics The right-hand table reports on parameters of the signal transmitted by the mobile phone:

MS Power	Absolute measured output power of the mobile phone,
Carr. Freq. Err.	Deviation of the measured mobile phone carrier frequency from the nominal channel frequency,
MS Synch. Det.	IS 136 standard synchronization pattern detected (see also section *Control of Input and Output Signals (Connection Control – Signal)* on page 4.43 ff) and percentage of bursts with this synch. pattern.

Limit Check A red output field and an arrow pointing upwards indicates that the BER result exceeds the upper limit set by means of the *Limit* softkey.

Progress bar The progress bar below the *BER* table shows the measurement time relative to the total duration of the statistics cycle (indicated in s below the progress bar).

Remote control

```
READ[:SCALar]:RXQuality:BER[:RESult]? etc.
CALCulate[:SCALar]:RXQuality:BER[:RESult]:MATChing?
```

Popup Menu Connection Control

The menu group *Connection Control* consists of three popup menus which configure the inputs and outputs of the CMU and the respective signals in the function group *IS 136 800-MS Non Signalling.*

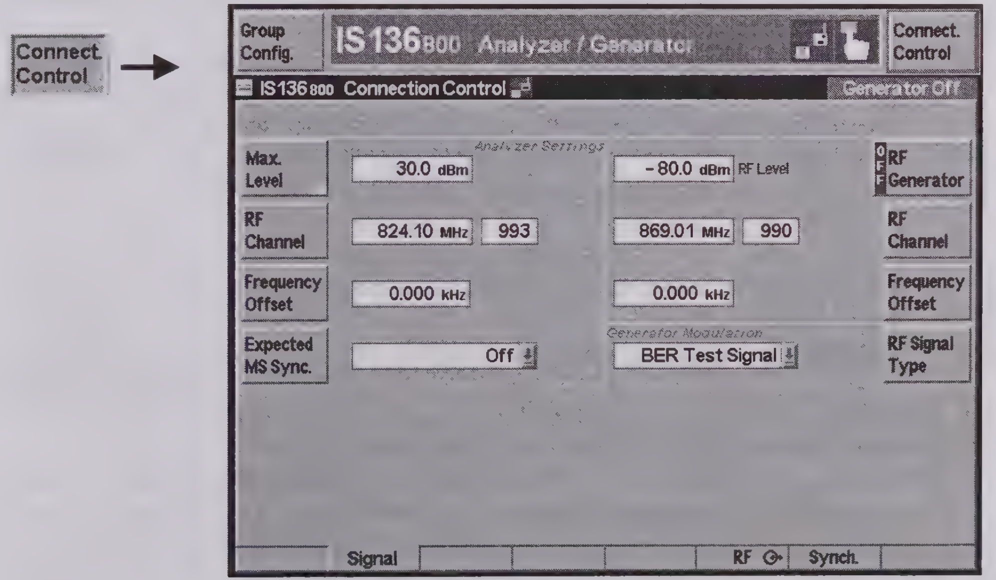
The menu group is activated via the softkey *Connect. Control* to the right of the header of each measurement menu. The individual popup menus *(Signal, RF ⊶* and *Synch.)* can be accessed via the hotkeys at the lower edge of the screen.

Control of Input and Output Signals (Connection Control – Signal)

The popup menu *Signal* configures the signals generated by the RF generator of the CMU (right side) and those measured by the instrument (left side). The following settings are possible in three panels:

- Maximum level *(Max. Level)*, channel *(RF Channel)*, *Frequency Offset*, and synchronization pattern *(Expected MS Sync.)* of the signal analyzed by the CMU *(Analyzer Settings)*
- Level *(RF Level)*, channel *(RF Channel)* and frequency offset *(Freq. Offset)* of the signal generated *(RF Generator)*
- The RF signal type *(Expected MS Sync.)*

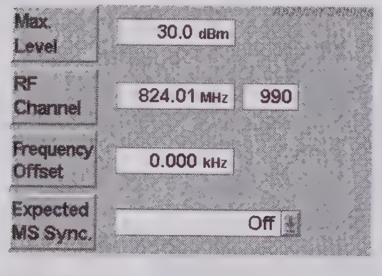
All setting values of this menu are also displayed in the main menu *Analyzer/Generator* (see page 4.2).


Connect. Control
Group Config.
IS136 800 Analyzer / Generator
Connect. Control
IS136 800 Connection Control
Generator Off
Analyzer Settings
Generator Modulation
OFF
RF Generator
Signal
RF ⊶
Synch.

Max. Level: 30.0 dBm
RF Channel: 824.10 MHz 993
Frequency Offset: 0.000 kHz
Expected MS Sync.: Off
RF Level: -80.0 dBm
RF Channel: 869.01 MHz 990
Frequency Offset: 0.000 kHz
RF Signal Type: BER Test Signal

Fig. 4-26 Connection Control – input and output signals

Panel Analyzer Settings



Max. Level 30.0 dBm
RF Channel 824.01 MHz 990
Frequency Offset 0.000 kHz
Expected MS Sync. Off

The panel *Analyzer Settings* contains four softkeys which specify

- The maximum expected input level *(Max. Level)*,
- The channel number or frequency *(RF Channel)*,
- An additional *Frequency Offset* and
- The synchronization pattern *(Expected MS Sync.)* of the signals measured by the CMU.

Max. Level

The *Max. Level* softkey sets the maximum expected input level.

This parameter is identical with the maximum input level set in the popup menu *Group Configuration* (see page 4.53). The range of values depends on the RF input used. If an external input attenuation is reported to the instrument (see section *RF Connectors (Connection Control – Connector/Ext. Att.)* on page 4.48), all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.

Input levels exceeding the *Max. Level* can not be measured; the corresponding measurement result fields indicate "– – –", and a message *Overload at Connector <Connector_no>* pops up.

The input field is activated when the softkey is pressed once (softkey selection, *Max. Level* can be edited). Pressing the selected softkey once again calls up the popup menu *Group Configuration* (see page 4.53) with the tab *Input Level*. The *Group Configuration* menu can be closed on pressing *Max. Level* for a third time.

Remote control `[SENSe:]LEVel:MAXimum <Level>`

RF Channel

The *RF Channel* softkey defines the channel number (if applicable) or frequency of the measured signal.

In the *Non Signalling* mode, RF frequencies can be entered in multiples of 10 kHz. If the frequency entered does not correspond to a designated IS 136 channel number, "---" is indicated in the associated channel input field. On turning the rotary knob, the current frequency is incremented or decremented by 30 kHz.

In the two IS 136 hyperbands, the assignment of channel numbers and frequencies is specified for both signal directions. Therefore, inside the bands, it is sufficient to enter only one value (frequency **or** channel number), the other one is automatically determined by the CMU.

The following tables contain the channel assignment in the reverse path (i.e. from mobile to base station/CMU). Channel numbers which are not listed in the tables are not assigned.

Table 4-1 IS 136 channels in the reverse path (mobile phone transmit)

Channel structure
IS 136 800 hyperband

Center Frequency / [MHz]	Channel	Band
0.03	—	not used
824.01	990	
824.04	991	A'' (1 MHz)
825	1023	
825.03	1	A (10 MHz)
834.99	333	
835.02	334	B (10 MHz)
844.98	666	
845.01	667	A' (1.5 MHz)
846.48	716	
846.51	717	B' (2.5 MHz)
848.97	799	
849 MHz	—	not used
2700 MHz	—	

Channel structure
IS 136 1900 hyperband

Center Frequency / [MHz]	Channel	Band[4]
0.03	—	not used
1850.01	1	
1850.04	2	A (15 MHz)
1865.01	501	
1865.04	502	D (5 MHz)
1869.99	667	
1870.02	668	B (15 MHz)
1884.99	1167	
1885.02	1168	E (5 MHz)
1890.00	1334	
1890.03	1335	F (5 MHz)
1895.01	1501	
1895.04	1502	C (15 MHz)
1909.92	1998	
1909.95	1999	not used
2700	—	

The RF frequency can be set in multiples of 10 kHz. It can be modified by an additional *frequency offset* entered in the input field below.

Remote control

```
[SENSe:]RFANalyzer:FREQuency:UNIT <Unit>
[SENSe:]RFANalyzer:FREQuency <Frequency>
```

Frequency Offset

The *Frequency Offset* softkey modifies the analyzer frequency set via *RF Channel* by a positive or negative offset value.

This enables fine-tuning of the frequency measured by the CMU, e.g. in order to simulate a Doppler shift (caused by a relative movement between mobile and base station) or de-tuning of the mobile.

Remote control

```
[SENSe:]RFANalyzer:FREQuency:OFFSet <Offset>
```

Expected MS Sync.

The *Expected MS Sync.* softkey defines a synchronization pattern for the measured signal.

The synchronization pattern in the reverse channel TDMA burst identifies the slot number and provides timing information for the decoder. It is defined in the standard.

In IS 136-MS tests, the synchronization pattern is used to distinguish between different burst types and for fine tuning: If a particular synchronization pattern is specified, the CMU only searches for bursts with this pattern; other burst types are discarded. The following settings are possible:

IS 136 1 to 6	*IS 136* standard synchronization patterns

---

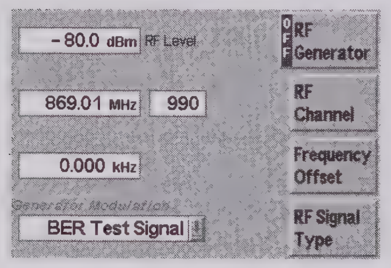
[4] Simplified channel representation. The bands A to F in the 1900 MHz hyperband overlap such that channels 499 to 501 belong to both band A and D, channels 666 to 667 to band D and B, channels 1166 to 1167 to band B and E, channels 1333 to 1334 to band E and F, and channels 1499 to 1501 to band F and C.

Off	Measurement without detection of the synchronization pattern
All	Signal checked for arbitrary synch. pattern; the detected synchronization pattern is used for fine tuning of the measurement.

IS 136 synch. patterns The 6 synch. patterns *IS 136 1 to IS 136 6* are specified in the standard and quoted in the command description in chapter 6 of this manual.

Remote control `[SENSe:]RFANalyzer:EMSSync <SyncPattern>`

RF Generator Panel


- 80.0 dBm RF Level
869.01 MHz 990
0.000 kHz
Generator Modulation
BER Test Signal

The *RF Generator* panel contains three softkeys which define

- The maximum generator level (main softkey *RF Generator)*,
- The channel number and corresponding frequency *(RF Channel)*,
- an additional frequency offset *(Freq. Offset)* for the signals generated by the RF generator,
- a bit sequence to be modulated onto the RF carrier *(RF Signal Type)*.

RF Generator

The softkey *RF Generator* defines the generator level and indicates the operating status of the RF generator *(ON | OFF)*.

The level is entered in dBm. The value range depends on the selected RF output (RF 1, RF 2 or RF 3 OUT). The RF generator can be switched on or of after softkey selection (press once) using the *ON/OFF* key.

Remote control

```
INITiate:RFGenerator; ABORt:RFGenerator
FETCh:RFGenerator:STATus?
```

External attenuation

If an external gain or attenuation is used and reported to the instrument (see softkey *Ext. Att. Output*) the RF generator level is adjusted to maintain the commanded power after the attenuation or gain. As a consequence, all levels indicated are referenced to the input of the DUT and no longer correspond to the actual level at the output connectors of the CMU (see section *RF Connectors (Connection Control – Connector/Ext. Att.)* on page 4.48). The default value for the generator power is also shifted provided that the generator can output the required power, compensating for the external attenuation or gain.

Error messages

If the level defined for *RF Level* is too high or too low, a window will appear with the error message "*<RF_Level> is out of range. <Permissible max. value> is limit.*" and three fields:

Accept	Permissible max. value is accepted as *Max. Level*,
Re-edit	The *Max. Level* is entered once again,
Cancel	The last valid input is maintained.

When switching over to a different output, the current value of *Max. Level* is automatically adapted, if required:

- towards lower values to the maximum permissible value of the new output,
- towards higher values to the minimum value of the new output.

Remote control `SOURce:RFGenerator:LEVel <Level>`

RF Channel

The *RF Channel* softkey defines the channel number (if applicable) or the frequency of the generated RF signal.

RF frequencies can be entered in multiples of 10 kHz. In the two IS 136 hyperbands, the assignment of channel numbers and frequencies is specified for both signal directions. Therefore, inside the bands, it is sufficient to enter only one value (frequency **or** channel number), the other one is automatically determined by the CMU.

In *Non Signalling* mode, the measurements may also be taken outside the IS 136 bands. If an out-of-band frequency is entered, the associated channel field indicates '---'.

The following tables contain the channel assignment in the forward channel (i.e. from the base station/CMU to the mobile phone). The channel frequencies are shifted by +45 MHz compared with the reverse path (duplex spacing, see above, *Panel Analyzer Settings*) in the 800 MHz hyperband and by 80.04 MHz in the 1900 MHz hyperband. Channel numbers which are not listed in the tables are not assigned.

Table 4-2 IS 136 channels in the forward path (base station transmit)

Channel structure
IS 136 800 hyperband

Center Frequency / [MHz]	Channel	Band
0.03	---	not used
869.01	990	
869.04	991	A" (1 MHz)
870	1023	
870.03	1	A (10 MHz)
879.99	333	
880.02	334	B (10 MHz)
889.98	666	
890.01	667	A' (1.5 MHz)
891.48	716	
891.51	717	B' (2.5 MHz)
893.97	799	
894	---	not used
2700	---	

Channel structure
IS 136 1900 hyperband

Center Frequency / [MHz]	Channel	Band[5]
0.03	---	not used
1930.05	1	
1930.08	2	A (15 MHz)
1945.05	501	
1945.08	502	D (5 MHz)
1950.03	667	
1950.06	668	B (15 MHz)
1965.03	1167	
1965.06	1168	E (5 MHz)
1970.04	1334	
1970.07	1335	F (5 MHz)
1975.05	1501	
1975.08	1502	C (15 MHz)
1989.96	1998	
1989.99	1999	not used
2700	---	

Remote control

```
SOURCe:RFGenerator:FREQuency:UNIT <Unit>
SOURCe:RFGenerator:FREQuency <Frequency>
```

---

[5] Simplified channel representation. The bands A to F in the 1900 MHz hyperband overlap such that channels 499 to 501 belong to both band A and D, channels 666 to 667 to band D and B, channels 1166 to 1167 to band B and E, channels 1333 to 1334 to band E and F, and channels 1499 to 1501 to band F and C.

Frequency Offset

The *Frequency Offset* softkey defines defines an offset for the frequency set under *RF Channel.*

This enables fine-tuning of the RF frequency generated by the CMU, for example for simulating a Doppler shift (due to a relative movement between mobile and base station) or de-tuning of the mobile.

Remote control `SOURce:RFGenerator:FREQuency:OFFSet <FrequencyOffset>`

RF Signal Type

The *RF Signal Type* softkey selects a bit modulation sequence for the generated RF signals.

The following options are available:

BER Test Signal	Fixed bit sequence used for bit error rate test
CW	No signal superimposed, "empty" carrier (continuous wave)
PRBS	Pseudo random bit sequence

Note: *The* RX Quality *measurement (see p. 4.40 ff) will fail (i.e. yield unrealistically high bit error rates) unless the generator signal is configured as* BER Test Signal.

The BER test signal simulates three full-rate users with the following time-slot and Digital Verification Color Code (DVCC) configurations:

User	1	2	3
Timeslot	1 & 4	2 & 5	3 & 6
DVCC	1	2	3

The mobile station may need to be reconfigured accordingly, in order to attain the synchronization necessary to run the BER tests.

Remote control `SOURce:RFGenerator:MODulation:RFS:TYPE <Selection>`

RF Connectors (Connection Control – Connector/Ext. Att.)

The popup menu *RF* ⊶ configures the connectors for RF signals. This includes the setting of

- The RF input and output of the CMU *(RF Output, RF Input)*
- An external attenuation at the connectors (Ext. Att. Output, Ext. Att. Input)

Connect. Control →

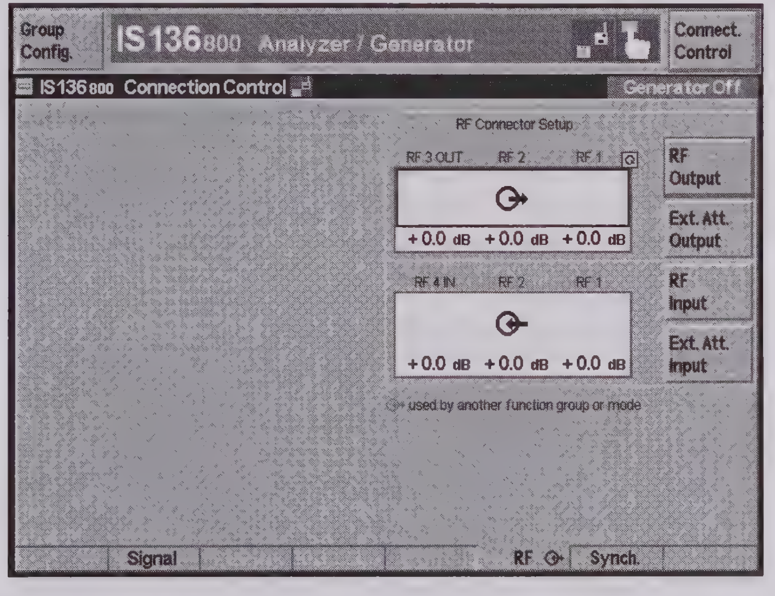

Group Config.
IS136 800 Analyzer / Generator
Connect. Control
IS136 800 Connection Control
Generator Off
RF Connector Setup
RF 3 OUT
RF 2
RF 1
+0.0 dB
+0.0 dB
+0.0 dB
RF 4 IN
RF 2
RF 1
+0.0 dB
+0.0 dB
+0.0 dB
⊶ used by another function group or mode
RF Output
Ext. Att. Output
RF Input
Ext. Att. Input
Signal
RF ⊶
Synch.

Fig. 4-27 Connection Control – RF connectors

The *Power* measurement is explained in section *Wide-Band Power* on page 4.48.

RF Output

The *RF Output* softkey defines which of the three connectors RF 1, RF 2 and RF 3 OUT is to be used as RF output connector.

The selected RF output is indicated by a ⊶ symbol.

Note: *Input and output connectors can be arbitrarily combined. The bidirectional connectors RF 1 and RF 2 can be selected as RF inputs and outputs at the same time.*

The LEDs on the front panel are only „on“ (light) if the generator is switched on.

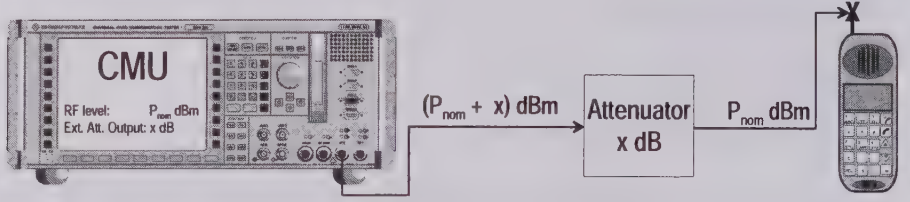
Remote control `OUTPut[:STATe] RF1 | RF2 | RF3`

Ext. Att. Output

The softkey *Ext. Att. Output* defines an external attenuation (or gain, if the value is negative) at the selected RF output.

Input of an external attenuation is suitable if, e.g., a path attenuation (cable) is included in the test setup, which is to be corrected by an increased signal level.

If an external attenuation is defined, the output signal level is referenced to the input of the DUT, the generator level is therefore shifted with respect to the actual level at the input connector of the CMU. The default value for the generator power and the level ranges for the RF outputs are also shifted provided that the generator can output the required power, compensating for the external attenuation or gain. Otherwise it is adapted to the level closest to the shifted default value.


CMU
RF level: P_{nom} dBm
Ext. Att. Output: x dB
(P_{nom} + x) dBm
Attenuator
x dB
P_{nom} dBm

Remote control `[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]`

RF Input

The *RF Input* softkey determines which of the three connectors RF 1, RF 2 and RF 4 IN is to be used as RF input connector.

The selected RF output is indicated by a ⊖ symbol. Input and output connectors can be arbitrarily combined.

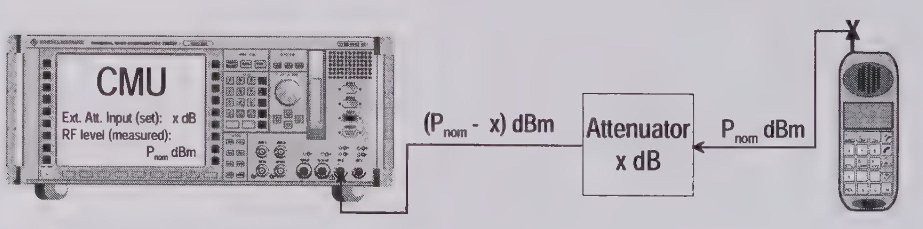
Remote control `INPut[:STATe] RF1 | RF2 | RF4`

Ext. Att. Input

The softkey *Ext. Att. Input* enters the value of the external attenuation (or gain) at the selected RF input.

Input of an external attenuation is required if, for example, external attenuator pads are used for protection of the sensitive RF inputs of the CMU or if a path attenuation is included in the test setup.

If an external input attenuation is reported to the instrument, all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.


CMU
Ext. Att. Input (set): x dB
RF level (measured):
P_{nom} dBm
(P_{nom} - x) dBm
Attenuator
x dB
P_{nom} dBm

Note: *The LEDs on the front panel are only "on" (light) if the measurement is active.*

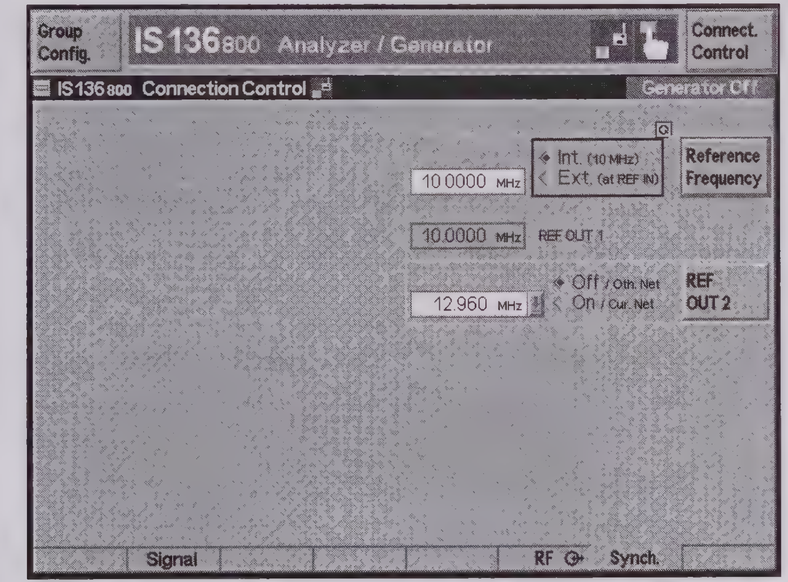
Remote control `[SENSe:]CORRection:LOSS:INTPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]`

Reference Frequency (Connection Control – Synch.)

The popup menu *Synch.* defines the reference signals for synchronization. This includes

- The internal or external *Reference Frequency*
- The output mode for the network-specific system clock *(REF OUT 2)*

Connect. Control →



◆ Int. (10 MHz)
Ext. (at REF IN) 10.0000 MHz

REF OUT 1 10.0000 MHz

◆ Off / Oth. Net
On / Cur. Net 12.960 MHz

Fig. 4-28 Connection Control – Synchronization

Reference Frequency

The *Reference Frequency* softkey determines the source and the frequency of the reference signal.

The associated field permits to select between two alternatives:

Int. (10 MHz)	internal synchronization with 10 MHz (TCXO or OCXO, CMU-B11/-B12) applied to output REF OUT 1 at the rear of the instrument.
Ext. (at REF IN)	external reference signal to be fed in via input *REF IN* and applied to output REF OUT 1 at the rear of the instrument.

The frequency of the external reference signal must be entered in the input field next to the *External* button.

The reference signal used is applied to output *REF OUT 1* so that it can be fed to other instruments as well. It can be used for synchronization to another instrument.

Notes:

1. *With external synchronization selected, the header cyclically displays a warning if no synchronization has been performed e.g. because of missing or faulty input signal.*
2. *In the case of external synchronization with squarewave signals (TTL) ensure correct signal matching to avoid reflections. Otherwise, resulting overshoots may cause trigger problems at the CMU input. A possible remedy is to use a lowpass filter or an attenuator pad directly at the CMU input. Correct synchronization may be checked by comparing the signal REF OUT 1 or REF OUT 2 with the input signal.*
3. *This configuration is valid in **all** CMU function groups.*

Remote control

```
CONFigure:SYNChronize:FREQuency:REFerence:MODE <ON | OFF>
CONFigure:SYNChronize:FREQuency:REFerence <Frequency>
```

REF OUT 2

The softkey *REF OUT 2* configures a network-specific system clock REF OUT 2 to be fed to the output *REF OUT 2* at the rear of the instrument.

The associated field permits to select between two alternatives:

OFF (other network)	The clock frequency of the current function group is not fed to the output *REF OUT 2*. With this setting the system clock of another active function group (e.g. the 1900 MHz hyperband while the current hyperband is 800 MHz) is still applied to *REF OUT 2* provided that the output *REF OUT 2* is switched on in the other function group. However, if *REF OUT 2* is explicitly switched over from *On* to *Off* the clock signal is definitely removed.
On (current network)	The network-specific system clock of the current function group is fed to output REF OUT 2. The system clock of any other function group applied to REF OUT 2 before is replaced.

The following clock frequencies may be selected:

38.88 MHz, 19.44 MHz, 12.96 MHz, 9.72 MHz

(The values are calculated according to the formula $F_{out} = 38.88\ MHz / n$ where $n = 1, ..., 4$)

The clock frequency can be used to synchronize other instruments.

Remote control

```
SOURce:DM:CLOCk:STATe ON | OFF
SOURce:DM:CLOCk:FREQuency <Frequency>
```

Popup Menu Group Configuration

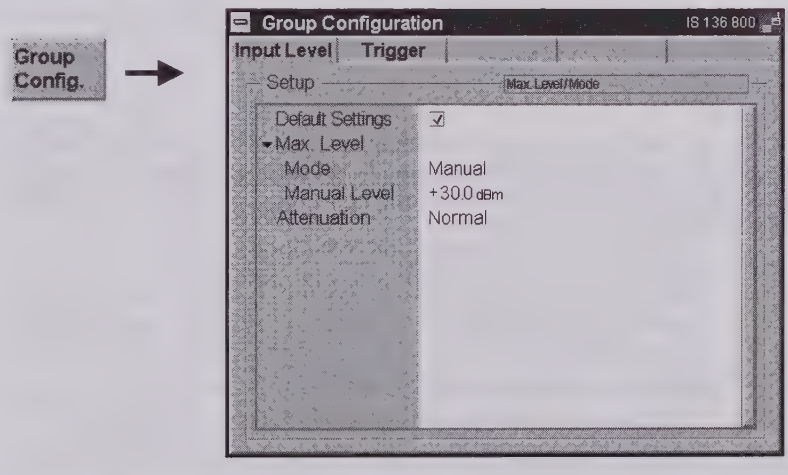
The popup menu *Group Configuration* contains two tabs that configure the function group *IS 136 800-MS Non Signalling* globally, i.e., it provides settings that are valid for all measurement menus within the function group. Most of these settings can be overwritten in the individual graphical measurement menus using softkeys and popup input fields.

The popup menu *Group Configuration* can be activated by pressing the softkey *Group Config.* at the top left in each measurement menu. It is possible to change between the tabs by pressing the associated hotkeys.

Input Level (Group Configuration – Input Level)

The tab *Input Level* provides settings for the measured input level (see also section *Connection Control* on page 4.43 ff):

- Maximum value *(Max. Level)*
- Attenuation or gain *(Attenuation)*



Default Settings ☑
Max. Level
Mode Manual
Manual Level +30.0 dBm
Attenuation Normal

Fig. 4-29 Group Configuration – Input level

Default Settings The Default Settings switch overwrites all settings in the *Input Level* tab with their default values. See command description in chapter 6.

Max Level – Mode The *Max. Level* table section sets the maximum input level which can be measured. The maximum input level is displayed next to the softkey *Max. Level* in the main menu *Analyzer/Generator* (see page 4.2).

Manual Manual input of maximum input level

Remote control `[SENSe:]LEVel:MODE MANual`

External attenuation

The range of values depends on the RF input used. If an external input attenuation is reported to the instrument (see section RF Connectors (Connection Control – Connector/Ext. Att.) on page 4.48), all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.

Input levels exceeding the *Max. Level* can not be measured; the corresponding measurement result fields indicate "– – –".

Error messages

If the value determined for *Max. Level* is too high or too low, a window with the error message *"<Max_Level> is out of range. <permissible max. value> is limit."* and three fields will appear:

Accept	The permissible max. value is accepted as Max. Level,
Re-edit	Max. Level is entered once again,
Cancel	The last valid input value is maintained.

When switching over to another input, the current value of *Max. Level* is automatically adapted, if required:

- towards lower values to the maximum value of the new input,
- towards upper values to the minimum value of the new input.

Remote control `[SENSe:]LEVel:MAXimum <Level>`

Attenuation

The *Attenuation* field defines how the RF analyzer of the CMU is tuned to meet the requirements of the current measurement type. In general, a compromise between the acceptable noise level in the displayed result and the contribution of internally generated distortion must be reached.

Normal	Mixer level in normal range,
Low noise	Mixer level enhanced by +10 dB (full dynamic range of CMU, therefore recommended for *Power* vs time and *Spectrum* measurements),
Low distortion	Mixer level reduced by –10 dB (high intermodulation spacing, therefore recommended for modulation measurements).

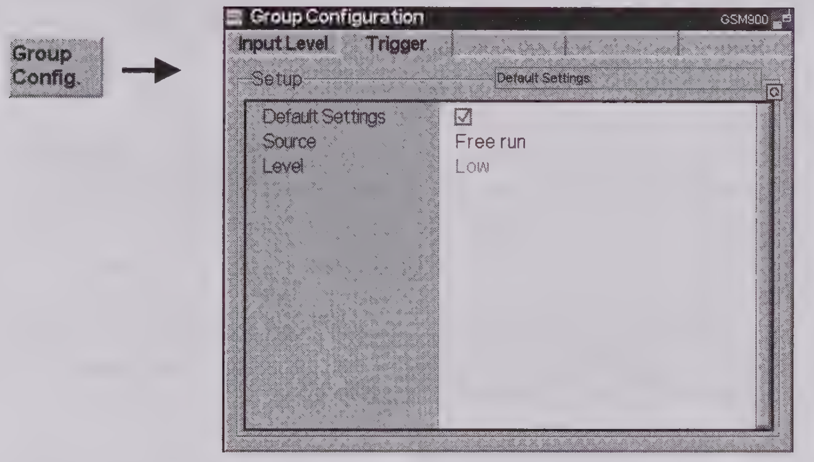
The *Attenuation* setting permits the CMU to be adapted to the requirements of the measurement. The advantages and disadvantages of the settings *Low noise* and *Low distortion* are listed in the following table.

	Advantages	**Disadvantages**
Low noise	Low noise high dynamic range	No RF overdrive reserve Risk of intermodulation
Low distortion	High intermodulation spacing	Lower dynamic range

Remote control `[SENSe:]LEVel:ATTenuation NORMal | LNOise | LDIStortion`

Trigger (Group Configuration – Trigger)

The tab *Trigger* defines the trigger condition for the measurement.



Default Settings ☑
Source Free run
Level Low

Fig. 4-30 Group Configuration – Trigger

Default The field *Default* assigns the default setting to all fields of the tab *Trigger*.

Remote control `CONFigure:TRIGger:DEFault ON | OFF`

Trigger The *Trigger* field determines how the measurement is to be triggered:

Free Run	Triggering by incoming TDMA burst that is detected by the instrument software,
RF Power	Triggering on the power (rising edge) of the incoming burst, broad-band trigger,
IF Power	Narrow-band trigger,
Extern	External trigger signal fed in via connector AUX3 (pin no. 8).

For the *RF Power* and *IF Power* parameters the signal to be measured must be a burst signal.

The external trigger can be selected for *Non Signalling* measurements only. In contrast, *Signalling* measurements can be triggered by the signal from the CMU signalling unit.

Remote control
```
TRIGger[:SEQuence]:SOURce
                FRUN | RFPower | IFPower | EXTern
```

Level The *Trigger Level* field determines the trigger threshold if the measurement is triggered by the *RF Power* or *IF Power*.

The trigger threshold is the level at which the trigger signal starts triggering. With free-run measurements or external trigger the *Trigger Level* field is disabled.

Low	Low trigger level, equal to the reference level – 26 dB
Medium	Medium trigger level, equal to the reference level – 16 dB
High	High trigger level, equal to the reference level – 6 dB

Remote control `TRIGger[:SEQuence]:THReshold LOW | MEDium | HIGH`

TDMA Mobile Tests (Signalling Mode)

This section provides detailed information on the measurement and configuration menus defined in function group *IS 136 800-MS Signalling*. It is organized like a typical measurement session including the following stages:

1. Call setup to the mobile station *(Connection Control – Signal)*,
2. Overview of measurements and general settings *(Overview)*,
3. Measurement menus *(Power, Modulation, Spectrum, Receiver Quality):* Performance of the measurements, output of measurement results, specific measurement configurations,
4. Global configurations *(Connection Control, Group Configuration).*

The most important menus of the function group *IS 136 800/1900-MS Signalling* are shown in an overview at the end of chapter 3 in the present manual.

A lot of menus and controls are similar or identical in the two operating modes for *IS 136 800/1900-MS* with and without signalling. These menus will only be presented with a summary explanation; the detailed description is found in the section *IS 136 800/1900-MS Non Signalling.*

Call Setup (Connection Control – Signalling)

The popup menu *Connection Control* controls signalling (call setup and release, services, signalling parameters) and configures the inputs and outputs with the external attenuation values and the reference frequency.

As the measurement mode requires an existing connection to the mobile station, the tabs controlling the call setup (*Connection Control – Signalling)* appear immediately after selection of the function group *IS 136 800/1900-MS Signalling* in the *Menu Select* menu. Alternatively, the *Connection Control* menu can be called up by pressing the softkey *Connect. Control* at the top right in every measurement menu; the individual tabs can be accessed via the hotkey bar at the lower edge of the screen. By pressing the *Escape* key, the *Connection Control* menu is closed and the CMU changes to the measurement mode.

In the following the first two tabs *Connection Control – Signalling* displayed immediately after activation of the function group are described. A description of the other tabs of the *Connection Control* menu is relegated to the end of this chapter (see section *Signalling Control in the Registered State* on page 4.76).

The term signalling denotes all procedures that are necessary for call setup and release as well as for control of a connection in the mobile radio network. In the case of IS 136 mobile station tests, a distinction is made between five different signalling states:

Signal Off	CMU transmits no signal
Signal On	CMU outputs a IS 136 control channel signal to which a mobile station can synchronize
Registered	Registration of the mobile station completed
Alerting	Mobile is being called by the CMU (after registration or without registration)
Call Established	Call connection to mobile station established, mobile picked up

A number of control commands which can be initiated both by the CMU *(Call to MS)* and by the mobile station *(Call from MS)* switch between these states (in Fig. 4-1, processes initiated by the mobile station are indicated by dashed lines).

A lot of applications within the function group *IS 136 800/1900-MS Signalling* are only possible or useful in a particular signalling state (for example, a handoff between various networks requires an existing connection between CMU and mobile station, i.e. it is only possible in the *Call Established* state). Accordingly, the *Connection Control* menus may vary depending on the signalling state.

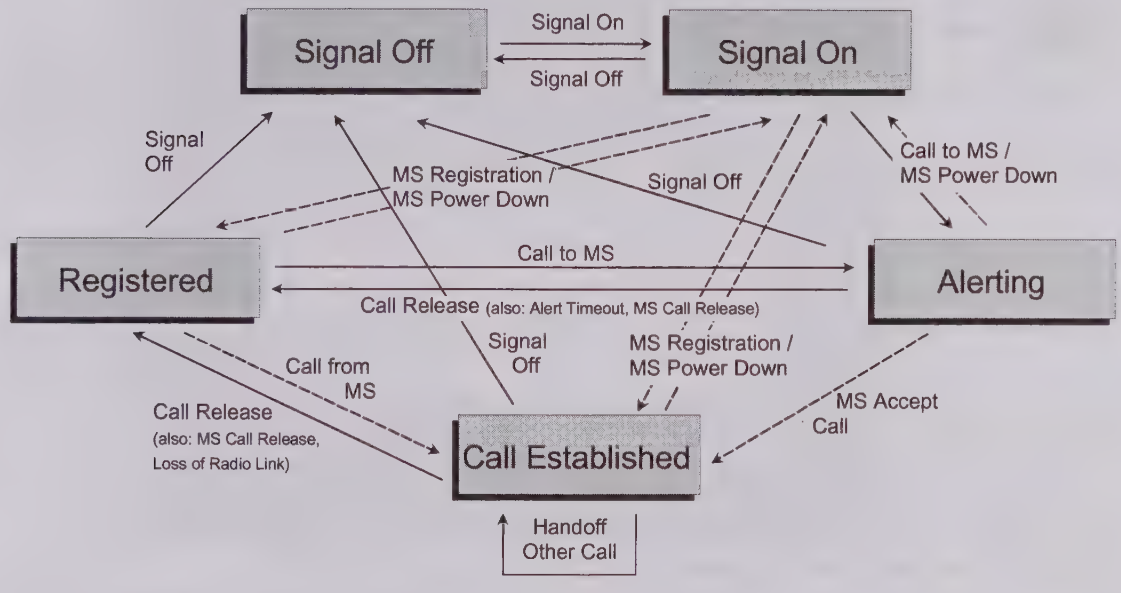

Signal Off
Signal On
Signal On
Signal Off
Signal Off
MS Registration /
MS Power Down
Signal Off
Call to MS /
MS Power Down
Registered
Call to MS
Alerting
Call Release (also: Alert Timeout, MS Call Release)
Signal Off
MS Registration /
MS Power Down
Call from MS
Call Release
(also: MS Call Release, Loss of Radio Link)
MS Accept Call
Call Established
Handoff
Other Call

Fig. 4-31 Signalling states of the CMU

Corresponding to the five possible signalling states, five different *Signalling* menus are available. When a signalling state is reached, the corresponding menu is opened automatically (exception: see softkey *Open Pop. autom.*).

Note: *For a complete overview of signalling states including the Handoff process see Fig. 6.1 in chapter 6 of this manual.*

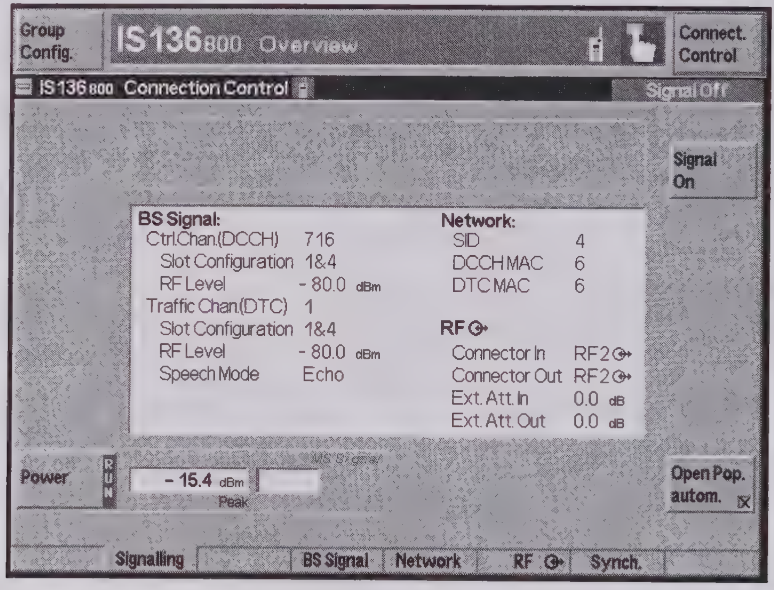
Signalling Control without Signal (State Signal Off)

The popup menu *Signalling (Signal Off)* provides information on:

- The most important parameters concerning the frequency and level of the signal sent by the CMU in the state *Signal On (BS Signal)*,
- The *Network* parameters,
- Selected RF connectors and external attenuation *(RF ⊖→)*,
- Status and result of the wide-band peak-power measurement *(Power)*.
- Besides, it activates the control channel signal for the call setup to the mobile station *(Signal On)*.

The popup menu *Signalling (Signal Off)* is opened when the function group *IS 136 MS Signalling* is selected, or if the DCCH signal is switched off *(Signal Off* softkey*)* while the system is in another signalling state. It is replaced by the *Signalling (Signal On)* menu after the DCCH signal on the CMU is switched on (Softkey *Signal On,* see Fig. 4-31).

Connect. Control →



BS Signal:
Ctrl.Chan.(DCCH) 716
Slot Configuration 1&4
RF Level - 80.0 dBm
Traffic Chan.(DTC) 1
Slot Configuration 1&4
RF Level - 80.0 dBm
Speech Mode Echo

Network:
SID 4
DCCH MAC 6
DTC MAC 6

RF
Connector In RF2
Connector Out RF2
Ext. Att. In 0.0 dB
Ext. Att. Out 0.0 dB

- 15.4 dBm Peak

Fig. 4-32 Connection Control – Signalling (Signal Off)

BS Signal	The table *BS Signal* indicates the most important parameters concerning the frequency and level of the control and traffic channel signals sent by the CMU in the state *Signal On*. These parameters are set in the tab *BS Signal* and explained in more detail there (see section *Signals of the CMU (Connection Control – BS Signal)* on page 4.87).
Remote control	`CONFigure:BSSignal...`
Network	The table *Network* indicates the System Identitiy *(SID)*, the Digital Control Channel Mobile Attenuation Code *(DCCH MAC)*, and the Digital Traffic Channel Mobile Attenuation Code *(DTC MAC)*. The codes are set in the tab *Network* and explained there in more detail (see section *Network Parameters (Connection Control – Network)* on page 4.90).
Remote control	`CONFigure:NETWork...`
RF	The table *RF* indicates the RF connectors and external attenuations. These parameters are set in the tab *RF* and are explained in more detail there (see section *RF Connectors (Connection Control – RF/AF Connector)* on page 4.49).
Remote control	`[SENSe:]CORRection:LOSS...?`

Power

The *Power* softkey controls the wide-band power measurement and indicates its state *(RUN | HLT | OFF)*.

In the associated fields, the peak power of the received signal is indicated as absolute numerical value and relative to the effective radiated power (ERP) of the mobile (analog bar). The analog bar views the RF input power range between *ERP – 10 dB* and *ERP + 10 dB*. The ERP depends on the DTC MAC set in the *Overview* menu and on the power class of the mobile; see Table 4-3 on page 4.68.

The result of the wide-band power measurement is usually slightly higher than the result of the *Power vs Time* measurement which is obtained with a matched filter according to the standard.

Remote control

```
INITiate:WPOWer
FETCh:WPOWer:STATus?
```

```
READ[:SCALar]:WPOWer[:RESult]?
FETCh[:SCALar]:WPOWer[:RESult]?
SAMPle[:SCALar]:WPOWer[:RESult]?
```

Signal On

The *Signal On* softkey switches on a control channel signal (DCCH) to which the mobile station can synchronize.

By switching on the signal, the CMU changes to the signalling state *Signal On*. A user prompt below the menu header indicates the function of this softkey.

Remote control `PROCedure:Signalling:ACTion SON`

Open Pop. autom. ☐

The *Open Pop. autom.* softkey contains a field which activates or suppresses display of the popup menu *Signalling (Signal Off)*.

- In the default setting (*Open Pop. autom.* on), the popup menu is displayed each time the *Signal Off* state is reached (due to a change of the signalling state or function group).
- In the alternative setting (*Open Pop. autom.* off), the popup-menu is suppressed. Signalling may still be controlled, e.g., via the mobile. Moreover, the popup menu *Signalling (Signal Off)* can also be opened explicitly by pressing the corresponding hotkey in the menu group *Connection Control*.

Remote control –

Signalling Control with Signal (State Signal On)

The popup menu *Signalling (Signal On)* provides information on

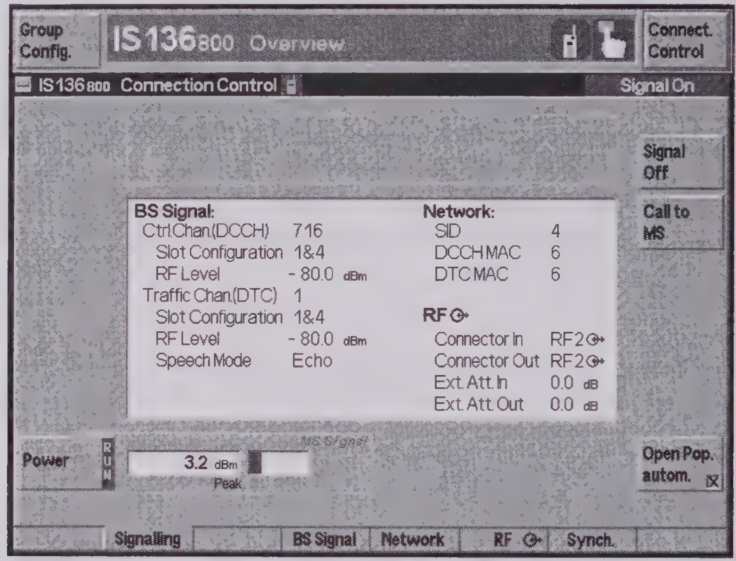
- The signals transmitted by the CMU *(BS Signal)*
- The network parameters *(Network)*
- The RF connectors *(RF ⊸)*
- The status and result of the peak power measurement *(Power)*

Besides, it contains softkeys which lead to other signalling states:

- Deactivating the control channel signal for establishing the first connection to the mobile station *(Signal Off)*
- Setting up a call to the mobile station (*Call to MS* -> state *Alerting)*

The popup menu *Signalling (Signal On)* is opened after the DCCH signal on the CMU is switched on (Softkey *Signal On* in the popup menu *Signalling (Signal Off)*). It is replaced by the *Signalling (Registered)* menu after the mobile station initializes a registration by itself. It is replaced by the *Signalling (Call Established)* menu if the mobile station sets up a call to the CMU. It is replaced by the *Signalling (Alerting)* menu if a mobile is called via the *Call to MS* softkey (see Fig. 4-31).

Connect. Control →



BS Signal:
Ctrl.Chan.(DCCH) 716
Slot Configuration 1&4
RF Level - 80.0 dBm
Traffic Chan.(DTC) 1
Slot Configuration 1&4
RF Level - 80.0 dBm
Speech Mode Echo

Network:
SID 4
DCCH MAC 6
DTC MAC 6

RF
Connector In RF2
Connector Out RF2
Ext. Att. In 0.0 dB
Ext. Att. Out 0.0 dB

MS Signal
3.2 dBm
Peak

Fig. 4-33 Connection Control – Signalling (Signal On)

The entries of the *BS Signal, Network,* and *RF* table sections and the *Power* softkey is described in section *Signalling Control without Signal (State Signal Off)* on page 4.57.

Signal Off

The *Signal Off* softkey switches off the CMU's control channel signal to which the mobile station can synchronize.

By switching off the signal the CMU changes to the signalling state *Signal Off.*

Remote control `PROCedure:Signalling:ACTion SOFF`

Call to MS

The *Call to MS* softkey sets up a call to the mobile station.

A user prompt below the header indicates that the mobile station must synchronize to the CMU signal first. After successful synchronization, the message *Paging in progress ...* is displayed below the header; the CMU changes to the signalling state *Alerting.* As soon as the mobile is picked up the CMU changes to the signalling state *Call Established.*

Note: *To set up a call, the CMU transmits fife page messages at maximum. If the* Call to MS *procedure still fails (e.g. because the mobile was not properly connected), the message* Call to mobile was not successful ! *is displayed in a message window. The message window is closed after a while or after it is confirmed by pressing the* ENTER *key.*

Remote control `PROCedure:Signalling:ACTion CTM`

Open Pop. autom. ☐

The softkey *Open Pop. autom.* contains a field which activates or suppresses the display of the popup menu *Signalling (Signal On).*

- In the default setting (*Open Pop. autom.* on), the popup menu is displayed each time the *Signal On* state is reached (due to a change of the signalling state or function group).
- In the alternative setting (*Open Pop. autom.* off), the popup-menu is suppressed. Signalling may still be controlled, e.g., via the mobile. Moreover, the popup menu *Signalling (Signal On)* can also be opened explicitly by pressing the corresponding hotkey in the menu group *Connection Control.*

Overview of the Function Group

The main menu *Overview* gives an overview of the function group *IS 136 800/1900-MS Signalling* including the most important settings and measurement results.

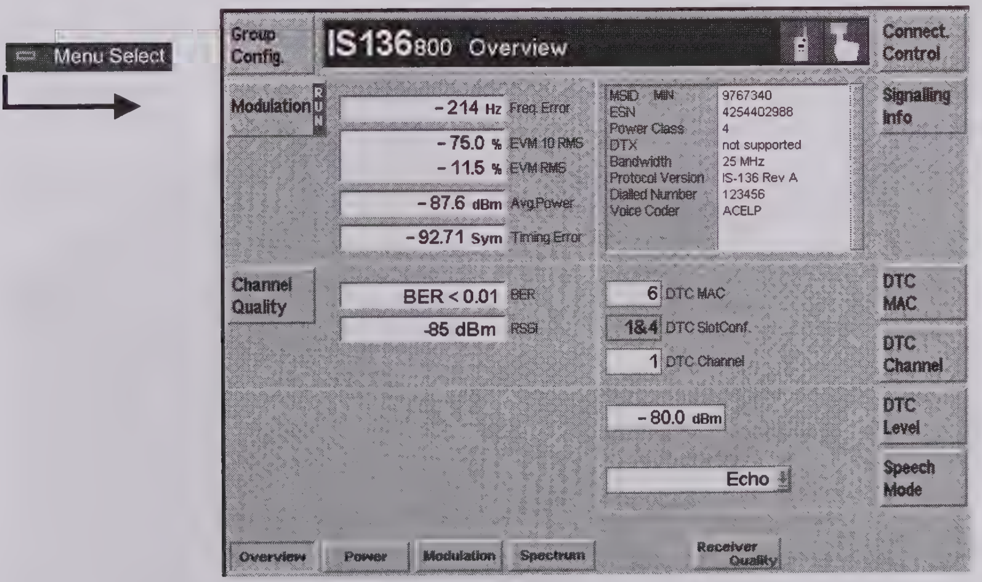
The panels on the left side report the following basic measurement results:

- The main softkey *Modulation* in the upper part controls the modulation measurement and informs on its current status (*RUN | HALT | OFF).* The individual measurement results displayed are discussed under the measurement menu Modulation on page 4.70 ff.
- In the panel *Channel Quality,* the *BER* level and received signal strength *(RSSI)* of the current traffic channel as reported by the mobile station is displayed (see section *Receiver Quality Measurements* on page 4.74).

The panels on the right side display signalling information and provide settings concerning the mobile station and the signals transmitted by the CMU:

Panel *Signalling Info*	Parameters of the mobile station	See page 4.90 ff
Panel *DTC*	Traffic channel settings[1]	See page 4.81 ff
Panel *BS Signal*	BS signal settings	See page 4.87

The main menu *Overview* is opened from the main menu *Menu Select* (with associated key at the front of the instrument) and after closing the configuration menu *Connection Control - Signalling* (using the *Escape* key or automatically after establishing a call connection). From the *Overview* menu, the remaining measurement menus of the function group *(Power, Modulation, Spectrum,* and *Receiver Quality)* can be accessed via hotkeys.



-214 Hz Freq. Error
-75.0 % EVM 10 RMS
-11.5 % EVM RMS
-87.6 dBm Avg.Power
-92.71 Sym Timing Error
BER < 0.01 BER
-85 dBm RSSI

MSID MIN 9767340
ESN 4254402988
Power Class 4
DTX not supported
Bandwidth 25 MHz
Protocol Version IS-136 Rev A
Dialled Number 123456
Voice Coder ACELP

6 DTC MAC
1&4 DTC SlotConf.
1 DTC Channel
-80.0 dBm
Echo

Fig. 4-34 Function overview – main menu Overview

---

[1] The DTC parameters represent the default settings if the CMU is in the *Signal Off, Signal Off, Registered,* or *Alerting* states. The default values are superseded by measurement results once the CMU is in the Call Established state.

Power vs. Time Measurements

The menu group *Power* contains the functions for measurement of the received signal power (burst analysis). The popup menu *Power Configuration* is used for configuration of the measurements; the measurement results are displayed in the graphical measurement menu *Power*.

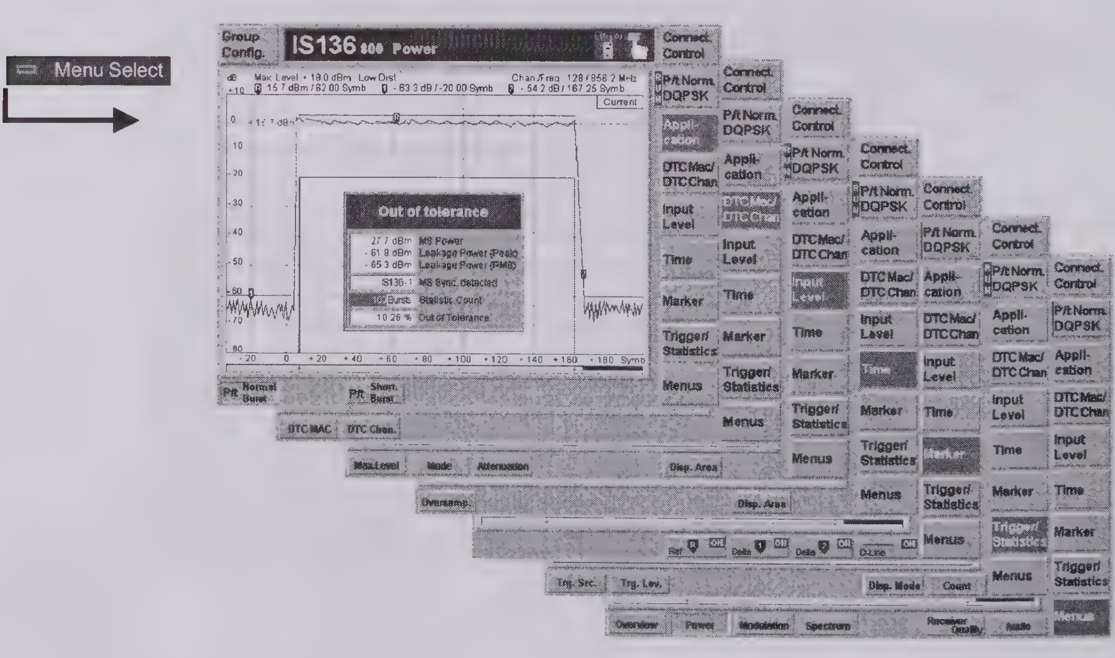
Most settings and functions of this menu do not depend on the signalling state and correspond to those of the menu *Power* in the operating mode *IS 136 800/1900-MS Non Signalling* (for a detailed description se p. 4.4 ff.).

Measurement Menu (*Power*)

The graphical measurement menu *Power* displays the results of the power measurement (burst analysis).

- The main softkey *Power* indicates the status of the power measurement *(RUN | HALT | OFF)* and opens the configuration menu *Power Config*.
- The other softkeys to the right of the test diagram are combined with various hotkeys. If a softkey is selected and an associated hotkey pressed, a popup window will appear which indicates the current setting and enables an entry.

The measurement menu *Power* can be accessed from any other measurement menu of function group *IS 136 800 Signalling* using the *Power* hotkey. It can be opened also from the *Menu Select* main menu (with the associated key at the front of the instrument).


Menu Select
Group Config.
IS136 800 Power
Current
Connect. Control
P/t Norm. DQPSK
Appli-cation
DTC Mac/ DTC Chan
Input Level
Time
Marker
Trigger/ Statistics
Menus
P/t Normal Burst
P/t Short. Burst
DTC MAC
DTC Chan.
Max.Level
Mode
Attenuation
Disp. Area
Oversamp.
Ref
Delta
D-Line
Trg. Src.
Trg. Lev.
Disp. Mode
Count
Overview
Power
Modulation
Spectrum
Receiver Quality
Audio

Max Level + 18.0 dBm Low Dist
Chan./Freq. 128 / 856.2 MHz
15.7 dBm / 62.00 Symb
- 83.3 dB / -20.00 Symb
- 54.2 dB / 167.25 Symb

Out of tolerance

27.7 dBm MS Power
- 61.8 dBm Leakage Power (Peak)
- 65.3 dBm Leakage Power (RMS)
IS136-1 MS Sync. detected
Bursts Statistic Count
10.26 % Out of Tolerance

Fig. 4-35 Measurement menu Power

Test Settings

Application	The *Application* softkey activates the selection of the DTC *(digital traffic channel)* burst type for the power measurement (see section *Limit Lines* on page 4.13 ff).
P/t Normal Burst	The *P/t Normal Burst* hotkey selects a normal burst (162 symbols).
Remote control	No explicit switchover command. All *Normal Burst* measurements are identified by the 2nd/3rd level keywords ...`POWer[:NBURst]`...
P/t Short. Burst	The *P/T Short. Burst* hotkey selects an shortened burst (142 symbols).
Remote control	No explicit switchover command. All *Short. Burst* measurements are identified by the 2nd/3rd level keywords ...`POWer[:SBURst]`...
DTC Mac / DTC Chan	The *DTC Mac / DTC Chan* softkey activates the selection of the digital traffic channel parameters.
DTC MAC	The *DTC MAC* hotkey sets the mobile attenuation code. The mobile attenuation code determines the effective radiated power of the mobile, see section *Limit Values for Average Burst Power (Power Configuration – Limits)* on page 4.68. It is also indicated in the *Overview* menu (see p. 4.61).
Remote control	`PROCedure:SIGNalling[:DTC]:MAC  0 ... 31`
DTC Chan.	The *DTC Chan.* hotkey sets the number of the digital traffic channel. The channel number is also indicated in the *Overview* menu (see p. 4.61).
Remote control	`PROCedure:SIGNalling[:DTC]:CHANnel <CH_Number>` `CONFigure:BSSignal[:DTC]:CHANnel <CH_Number>`
Input Level	The *Input Level* softkey sets the input level parameters.
Max. Level	The *Max. Level* hotkey defines the maximum expected input level. See also the section *Input Level (Group Configuration – Input Level)* on p. 4.95.
Remote control	`[SENSe:]LEVel:MAXimum <Level>`
Mode	The *Mode* hotkey defines how the reference level is determined. *Manual* Manual input of reference level *DMAC* Automatic setting according to the digital mobile attenuation code of the mobile phone. The DMAC is set in the *Overview* menu or using the softkey *DTC Chan.* (see above). See also section *Input Level (Group Configuration – Input Level)* on p. 4.95.
Remote control	`[SENSe:]LEVel:MODE  MANual | DMAC`

Attenuation The *Attenuation* hotkey defines an attenuation factor for the input signal.

Normal	Input signal is maintained unchanged,
Low Noise	Full dynamic range,
Low Distortion	High overdrive reserve.

See also section *Input level (Group Configuration – Input Level)* on p. 4.95.

Remote control `[SENSe:]LEVel:ATTenuation NORMal | LNOIse | LDIStortion`

Disp. Area The *Disp. Area* hotkey determines the display area.

Either the complete burst or particular parts of it can be selected, see section *IS 136 800/1900-MS Non Signalling* (p. 4.5 ff.).

Remote control No command, pure screen configuration.

Time The *Time* softkey configures the abscissa (time axis). All settings are identical with those in section *IS 136 800/1900-MS Non Signalling* (p. 4.5 ff.).

Marker The *Marker* softkey positions up to 3 markers and a D-line in the test diagram and outputs their values, see section *IS 136 800/1900-MS Non Signalling* (p. 4.5 ff.).

Trigger Statistics The *Trigger/Statistics* softkey sets the trigger condition, the statistics mode and the number of statistic counts, see section *Trigger ...* on page 4.96.

Difference from *Non Signalling* mode (p. 4.5 ff.):

In the mode *IS 136 800/1900-MS Signalling*, the measurement can be triggered by the signal from the CMU's signaling unit. Triggering by an additional external signal, however, is not possible.

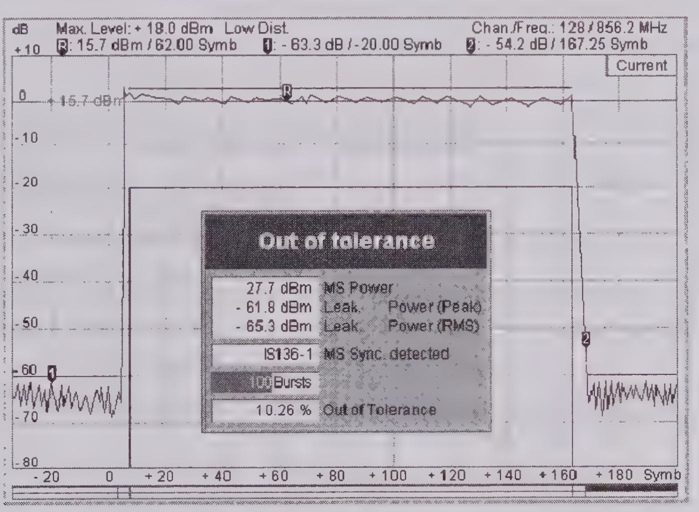
Menus The softkey *Menus* displays the hotkey bar for switching over to the other measurement menus.

Measurement Results

The values represented in the measurement menu *Power* can be divided into three groups:

- Settings
- Scalar measurement results (single values),
- Arrays (the trace plotted as a function of time).

The measurement results are indicated in two parameter lines, the test diagram and an info box:



Parameter line 1 / 2

Test diagram

Info box

```
dB   Max. Level: + 18.0 dBm  Low Dist.                                   Chan./Freq.: 128 / 856.2 MHz
+10  R: 15.7 dBm / 62.00 Symb   1: - 63.3 dB / -20.00 Symb   2: - 54.2 dB / 167.25 Symb
```

Current

Out of tolerance

```
   27.7 dBm  MS Power
 - 61.8 dBm  Leak.   Power (Peak)
 - 65.3 dBm  Leak.   Power (RMS)
     IS136-1 MS Sync. detected
         100 Bursts
     10.26 % Out of Tolerance
```

Fig. 4-36 Display of measurement results (Power menu)

Settings/ scalar results Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the info box, a popup window in the middle of the graphical screen *Power*.

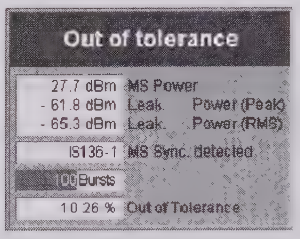
1st parameter line The first parameter line contains the following settings:

Max. Level	Maximum input level set as in *Input Level - Mode*,
Attenuation	Setting for the attenuation of the input level *(Normal, Low Noise, Low Distortion),*
Chan./Freq	RF channel and associated frequency.

2nd parameter line The second parameter line contains the following marker values:

R	Level and time of reference marker
1	Level and time of delta marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of delta marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Info box



Out of tolerance

27.7 dBm MS Power
- 61.8 dBm Leak. Power (Peak)
- 65.3 dBm Leak. Power (RMS)
IS136-1 MS Sync. detected
100 Bursts
10.26 % Out of Tolerance

The info box contains the following settings:

<No. of Bursts>	Number of bursts per statistics cycle.

In addition, the following scalar results are indicated:

MS Power	Average power of current burst (irrespective of the display mode selected and of the current trace)
Leakage Power	Mobile station transmit power during the carrier-off state; both the peak (Peak) and effective (RMS) value is indicated
MS Sync. detected	Standard synchronization pattern detected (see section Control of Input and Output Signals (Connection Control – Signal) on page 4.30 ff), or *Off*, if no synchronization pattern was found.
Burst Matching	Message if the displayed burst is out of tolerance. This message depends on the selected display mode.

Remote control

Settings are read out using the query corresponding to the setting command (setting command with appended question mark).

For scalar measurement results:

```
READ[:SCALar]:POWer:<Applic>[:DQPSk][:RESult]
FETCh[:SCALar]:POWer:<Applic>[:DQPSk][:RESult]?
SAMPle[:SCALar]:POWer:<Applic>[:DQPSk][:RESult]?

CALCulate[:SCALar]:POWer:<Applic>[:DQPSk]:CURRent
  [:RESult]:MATChing?
```

Traces (arrays)

The trace is displayed as a continuous curve in the test diagram together with the limit lines, markers and the D-line, if defined.

The trace in the *Power* measurement menu shows the measured burst power (in dB) as a function of time (in symbols). The displayed result depends on the test settings. The scale of the time axis is adapted to the burst type (application *Normal Burst* or *Short Burst*) selected. The display mode for the trace *(Minimum, Maximum, Average, Current)* is indicated in the upper right corner of the diagram.

Remote control

```
READ:ARRay:POWer:<Applic>[:DQPSk]:CURRent[:RESult]?
FETCh:ARRay:POWer:<Applic>[:DQPSk]:CURRent[:RESult]?
SAMPle:ARRay:POWer:<Applic>[:DQPSk]:CURRent[:RESult]? etc.
CALCulate:POWer:<Applic>[:DQPSk]:CURRent[:RESult]
  :MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?  etc.
```

Measurement Configurations (Power Configuration)

The popup menu *Power Configuration* contains three tabs which determine the parameters of power measurement and provide graphical tools for evaluation of the measurement results.

The popup menu *Power Configuration* is activated by pressing the softkey *Power* at the top right in the graphical measurement menu *Power*. It is possible to change between the tabs by pressing the associated hotkeys.

Measurement Control (Power Configuration – Control)

The tab *Control* controls the power measurement by determining

- The *Repetition* mode
- The *Stop Condition* for the measurement
- Besides, it influences the power display by adding a *Grid* or not.

All settings can be defined separately for the two applications *Normal Burst* and *Short. Burst*. They are described in the section *IS 136 800/1900 Non Signalling* on page 4.11 ff.

Limit Lines (Power Configuration – Limit Lines)

The tab *Limit Lines* defines the limit lines for the burst analysis. Limit lines are a graphical tool for defining and monitoring tolerance values. The tab enables

- A preview of the defined limit lines *(Area Info)*
- Definition of the limit lines for the current application (normal or shortened burst) section by section *(Limit Line Definition)*

Burst structure in IS 136 radio network

In the IS 136 radio network, all radio channels are divided into TDMA frames with 6 timeslots, each with a duration of 40/6 ms ≈ 6.67 ms. In this time mask, the mobile station can transmit bursts with different length and bit patterns. The CMU is able to measure the following burst types transmitted by IS 136 mobile phones:

Normal burst	Data and Signalling information transmission in the digital traffic channel (DTC) and in the digital control channels (DCCH) except RACH. A normal burst contains 162 symbols (324 bits).
Shortened burst	Traffic channel burst used to adjust the mobile phone's timing (dynamic time alignment). The shortened burst contains 120 symbols plus a guard time of 22 symbols.

Symbol structure

Mobile to base station, DCCH, normal burst

GP	R	PRE	SYNC	DATA	SYNC +	DATA
3	3	8	14	61	12	61

Mobile to base station, DTC, normal burst

GP	R	DATA	SYNC	DATA	SACCH	D	DATA
3	3	8	14	61	6	6	61

Mobile to base station, DTC, shortened burst

GP	R	S	D	4x0	S	D	8x0	S	D	12x0	S	D	16x0	S	AG
3	3	14	6	2	14	6	4	14	6	6	14	6	8	14	22

GP	Guard period; transmission-free time	R	Ramp time
PRE	Preamble	DATA	user information
SYNC, S	Synchronization	SYNC+	Additional synchronization
D	Coded digital verification color code		

Fig. 4-37 Burst structure of the TDMA reverse channel bursts

Burst power

As a function of time, the bursts can be divided into different areas. These areas are used as a basis for the definition of the limit lines and are shown in the following diagram (Fig. 4-38).

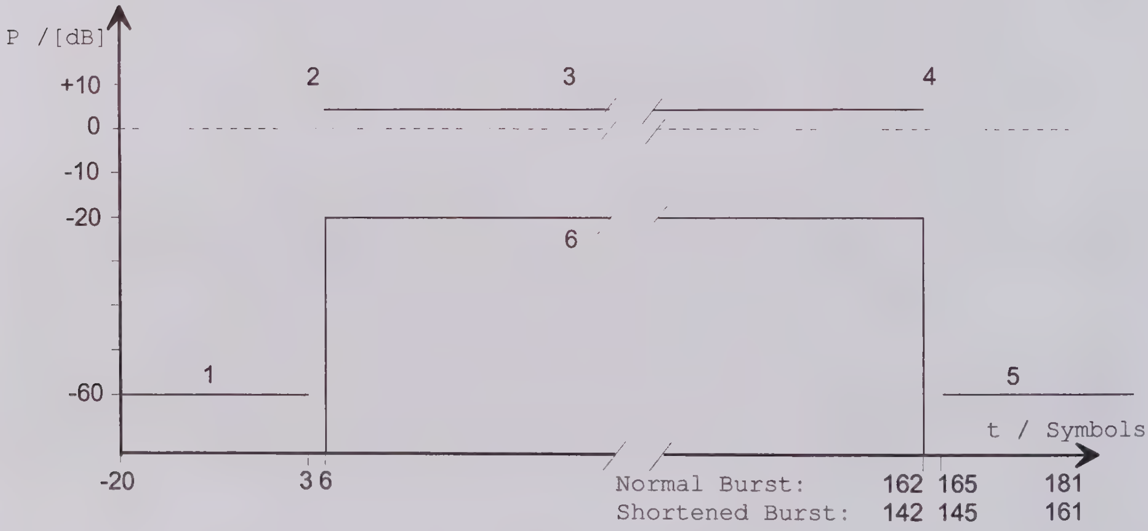


Fig. 4-38 Tolerance mask (limit lines) for normal and shortened bursts

All settings can be defined separately for the two applications *Normal Burst* and *Short. Burst*. They are described in the section *IS 136 800/1900 Non Signalling* on page 4.13 ff.

Statistic Count (Power Configuration – Statistics)

The tab *Statistics* defines the number of bursts constituting a statistic count and the display mode (i.e. the power ramp displayed).

All settings can be defined separately for the two applications *Normal Burst* and *Short Burst*. They are described in the section *IS 136 800/1900-MS Non Signalling* on page 4.15 ff. For explanation of the settings see also chapter 3.

Modulation Measurements

The menu group *Modulation* provides the functions for measurement of the modulation parameters, i.e. the frequency and phase error in the burst and matching of the respective tolerance limits. The popup menu *Modulation Configuration* is used for configuration of the measurements; the measurement results are displayed in the graphical measurement menu *Modulation*.

With the following exceptions (which also apply to the menu *Power)*, the menu group *Modulation* does not differ from its corresponding menu group in the measurement mode *IS 136 800/1900-MS Non Signalling* (see p. 4.17 ff.):

1. The mobile attenuation code (MAC) can be set with the *DTC Mac* and *DTC Channel* softkeys and can be used to define the input level *(Input Level* softkey).
2. The trigger settings *Signalling, Free Run, RF Power* and *IF Power* are available. The measurement can be triggered by the CMU's signalling unit. Triggering by an additional external signal, however, is not possible.

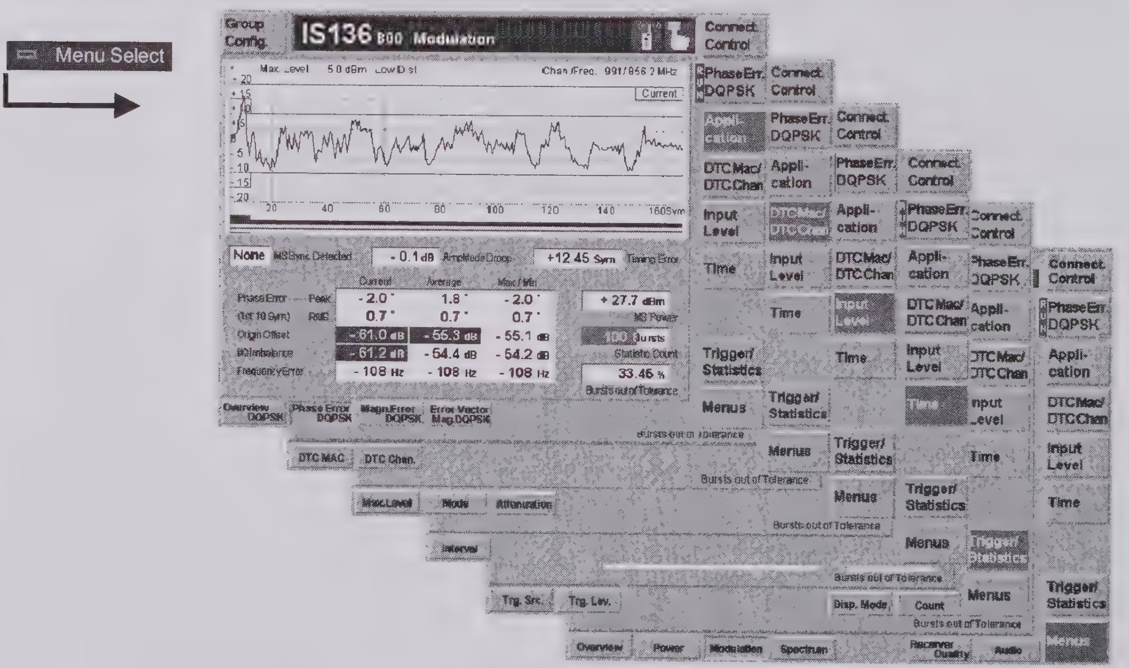

Menu Select
Group Config
IS136 800 Modulation
Connect Control
Max. Level 5.0 dBm Low Dist
Chan./Freq. 991/856.2 MHz
Current
20
40
60
80
100
120
140
160Sym
None MS Sync Detected
- 0.1 dB Amplitude Droop
+12.45 Sym Timing Error
Current Average Max/Min
Phase Error Peak -2.0 ° 1.8 ° -2.0 °
(1st 10 Sym) RMS 0.7 ° 0.7 ° 0.7 °
Origin Offset -61.0 dB -55.3 dB -55.1 dB
IQ Imbalance -61.2 dB -54.4 dB -54.2 dB
Frequency Error -108 Hz -108 Hz -108 Hz
+27.7 dBm MS Power
100 Bursts Statistic Count
33.46 % Bursts out of Tolerance
Overview DQPSK
Phase Error DQPSK
Magn.Error DQPSK
Error Vector Mag.DQPSK
Phase Err. DQPSK
Appli-cation
DTC Mac/ DTC Chan
Input Level
Time
Trigger/ Statistics
Menus
DTC MAC
DTC Chan.
Max.Level
Mode
Attenuation
Interval
Trg. Src.
Trg. Lev.
Disp. Mode
Count
Overview
Power
Modulation
Spectrum
Receiver Quality
Audio

Fig. 4-40 Measurement menu Modulation

Test Settings

The selections and test settings provided by the *Application and Time* softkeys are identical with those in the non signalling mode (see section *Test Settings* on page 4.19). The *DTC Mac/DTC Chan., Input Level, and Trigger/Statistics* softkeys are equal to the softkeys of the same name in the *Power* menu (see page 4.63).

Measurement Results

The values shown in the measurement menu *Modulation* can be divided into three groups:

- Setting values
- Scalar measurement results (single values),
- Arrays (traces plotted as a function of time).

The measurement menu for the *Overview* application shows all scalar results but no trace. The measurement menus for the remaining three applications are analogous and show the phase error, the (relative) magnitude error or the (relative) error vector magnitude as a function of time and the corresponding peak and effective values. The range and unit of the y-axis is adjusted to the measured quantity. In contrast to the *Non Signalling* mode (see p. 4.21 ff.) the first parameter line contains also the MAC of the mobile station, and the *Timing Error* is indicated. Besides the display and interpretation of the results are identical.

Timing Error The *Timing Error* output field, which is displayed in the right-hand output field of the *Modulation* measurement menu, indicates the time offset (in symbol periods) between the expected and the measured timing of the current burst. The expected timing results from the timing of the BS signal and the (known) timing advance of the mobile station.

The *Timing Error* can be determined with trigger mode *Signalling* only; see section Trigger (Group Configuration – Trigger) on page 4.96.

Measurement Configurations (Modulation Configuration)

The popup menu *Modulation Configuration* contains three tabs which define the parameters of the phase and frequency error measurement including the error tolerances.

The popup menu *Modulation Configuration* is activated by pressing the main softkey in the top right of the graphical measurement menu *Modulation* (this softkey reads *Phase Error, Magnitude Error* or *Err. Vector Magnitude*, depending on the selected application) twice. By pressing the associated hotkeys, it is possible to change between the tabs.

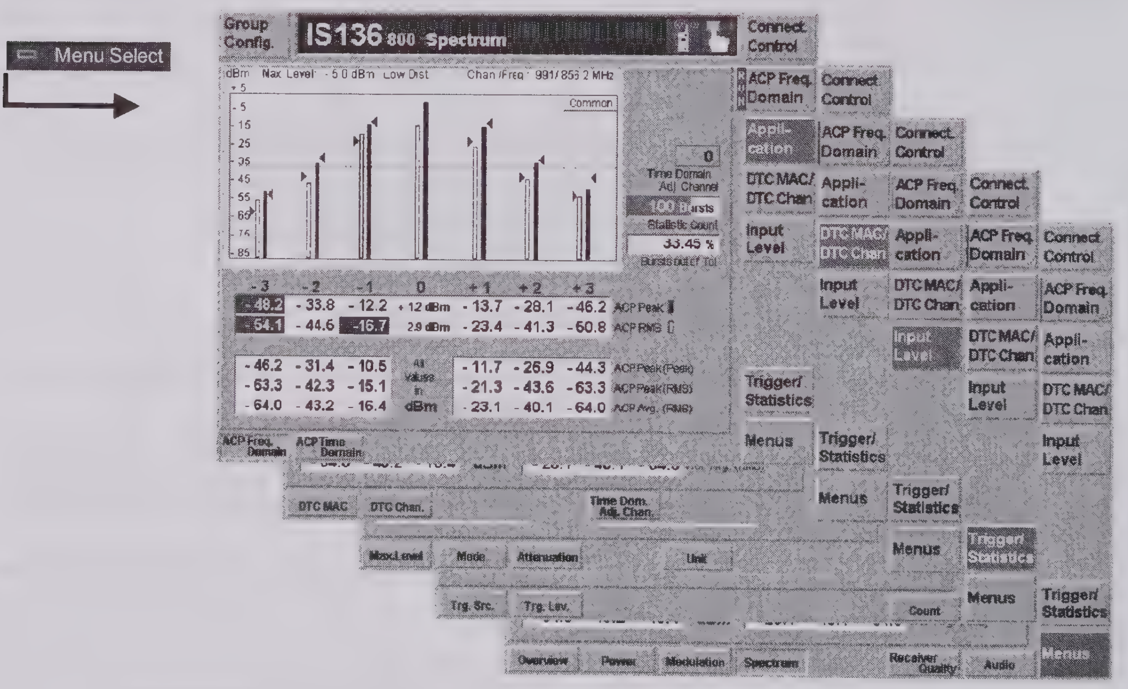
The functions of the *Modulation Configuration* menus are described in section *IS 136 800/1900-MS Non Signalling*, see p. 4.26 ff.

Adjacent Channel Power Measurements

The menu group *Spectrum* comprises the functions for measurement of the adjacent channel power (ACP) which can be measured and plotted either in the frequency or in the time domain. The measurement results are displayed in the graphical measurement menu *Spectrum*, the popup menu *Spectrum Configuration* is used for configuration of the measurements.

Apart from few exceptions (which also apply to the menu *Power*), the menu group *Spectrum* does not differ from its corresponding menu group in the measurement mode *IS 136 800/1900-MS Non Signalling* (see p. 4.17 ff.):

1. The mobile attenuation code (MAC) can be set with the *DTC Mac/DTC Chan.* softkey and can be used to define the input level *(Input Level* softkey).
2. The trigger settings *Signalling, Free Run, RF Power* and *IF Power* are available. The measurement can be triggered by the CMU's signalling unit. Triggering by an additional external signal, however, is not possible.


Menu Select
Group Config.
IS136 800 Spectrum
Connect. Control
dBm Max Level: - 5.0 dBm Low Dist Chan./Freq.: 991/ 853.2 MHz
Common
ACP Freq. Domain
Appli-cation
DTC MAC/ DTC Chan
Input Level
Trigger/ Statistics
Menus
Time Domain Adj. Channel
100 Bursts
Statistic Count
33.45 %
Bursts out of Tol
ACP Freq. Domain
ACP Time Domain
DTC MAC
DTC Chan.
Time Dom. Adj. Chan.
Max.Level
Mode
Attenuation
Unit
Trg. Src.
Trg. Lev.
Count
Overview
Power
Modulation
Spectrum
Receiver Quality
Audio

- 3	- 2	- 1	0	+ 1	+ 2	+ 3	
- 48.2	- 33.8	- 12.2	+ 12 dBm	- 13.7	- 28.1	- 46.2	ACP Peak
- 54.1	- 44.6	- 16.7	2.9 dBm	- 23.4	- 41.3	- 60.8	ACP RMS
- 46.2	- 31.4	- 10.5	All values in dBm	- 11.7	- 26.9	- 44.3	ACP Peak(Peak)
- 63.3	- 42.3	- 15.1		- 21.3	- 43.6	- 63.3	ACP Peak(RMS)
- 64.0	- 43.2	- 16.4		- 23.1	- 40.1	- 64.0	ACP Avg. (RMS)

Fig. 4-41 Measurement menu Spectrum

Test Settings

The selections and test settings provided by the *Application and Time* softkeys are identical with those in the non-signalling mode (see section *Test Settings* on page 4.31). The *DTC Mac/DTC Chan., Input Level, and Trigger/Statistics* softkeys are equal to the softkeys of the same name in the *Power* menu (see page 4.63).

Measurement Results

The *Spectrum* measurement menu and the results depend on the selected display range (application, i.e. *ACP Frequency Domain* or *ACP Time Domain)*. The range and unit of the y-axis is adjusted to the measured quantity.

In contrast to the *Non Signalling* mode (see p. 4.21 ff.) the first parameter line contains also the MAC of the mobile station. Besides the display and interpretation of the results is identical.

Spectrum Configurations (Spectrum Configuration)

The popup menu *Spectrum Configuration* contains three tabs which define the parameters of the spectrum measurement including the error tolerances.

The popup menu *Spectrum Configuration* is activated by pressing the main softkey in the top right of the graphical measurement menu *Spectrum* twice (this softkey reads *ACP Frequency Domain* or *ACP Time Domain*, depending on the selected application). By pressing the associated hotkeys, it is possible to change between the tabs.

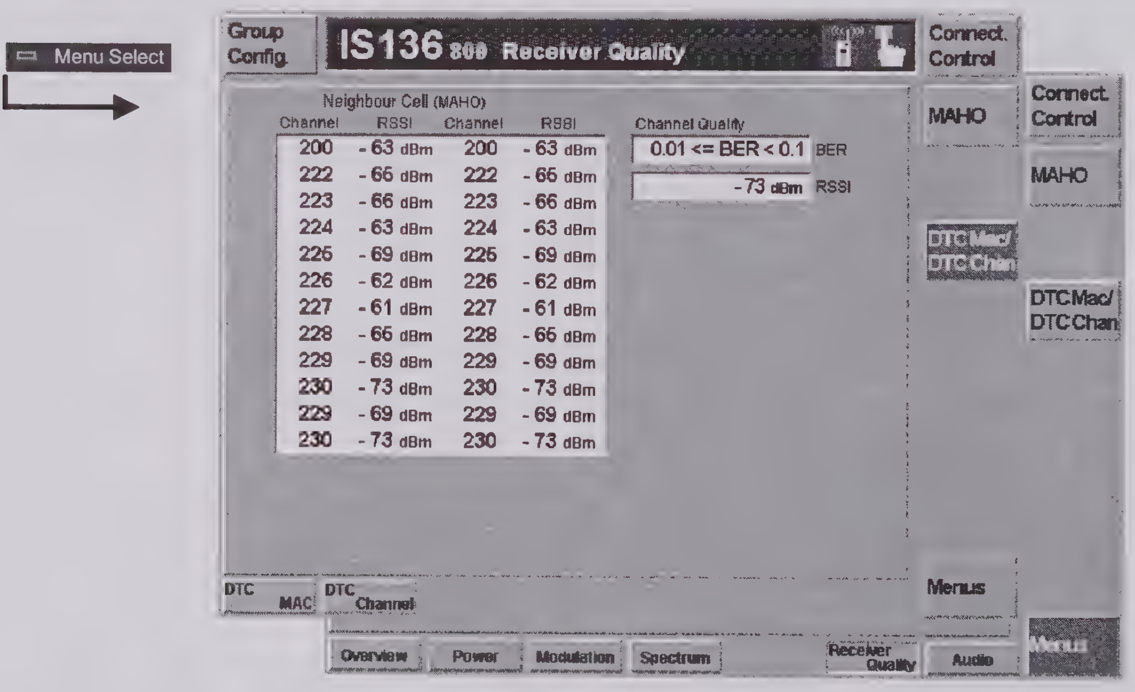
The functions of the *Spectrum Configuration* menu is described in section *IS 136 800/1900-MS Non Signalling*, see p. 4.41 ff.

Receiver Quality Measurements

The menu group *Receiver Quality* assesses the sensitivity of the mobile station receiver via a bit error rate test. Instead of the the application *BER* (Single Shot bit error rate tests) provided in the measurement mode *IS 136 800/1900-MS Non Signalling* (see p. 4.17 ff.), the mobile-assisted handoff report (MAHO) is available in *Signalling* measurements (Signalling state *Call Established*).

Mobile assisted handoff is a process in which a mobile operating on a DTC measures the received signal strength (RSS) and BER on its current DTC and the RSS on up to 24 neighbor cell channels and reports this information to the network. The MAHO channels that the network sends to the mobile for measurement are typically the channels on which the DCCHs of neighboring cells and sectors are located.

The network uses the MAHO report to decide whether the mobile should be handed off to another traffic channel. For the CMU, the contents of the MAHO report are automatically provided by the mobile phone and do not represent real measured quantities.



Neighbour Cell (MAHO)

Channel	RSSI	Channel	RSSI
200	- 63 dBm	200	- 63 dBm
222	- 66 dBm	222	- 66 dBm
223	- 66 dBm	223	- 66 dBm
224	- 63 dBm	224	- 63 dBm
225	- 69 dBm	225	- 69 dBm
226	- 62 dBm	226	- 62 dBm
227	- 61 dBm	227	- 61 dBm
228	- 66 dBm	228	- 66 dBm
229	- 69 dBm	229	- 69 dBm
230	- 73 dBm	230	- 73 dBm
229	- 69 dBm	229	- 69 dBm
230	- 73 dBm	230	- 73 dBm

Channel Quality

BER: 0.01 <= BER < 0.1

RSSI: - 73 dBm

Fig. 4-42 Measurement menu Receiver Quality (application MAHO)

Measurement Results

In the MAHO application which requires a call connection between the CMU and the mobile phone (signalling state *Call Established*), the following quantities are displayed (see Fig. 4-42).

Output fields	The *BER* and *RSSI* output fields indicate the channel quality (measured *BER* level) and received signal strength *(RSSI* reported by the mobile phone) in the current traffic channel.
Remote control	`[SENSe:]RXQuality:CQUality:BER?` `[SENSe:]RXQuality:CQUality:RSSI?`
MAHO Table	The *Neighbor Cell (MAHO)* table contains the channel numbers and RSSI (reported by the mobile phone) in up to 24 neighbor *channels (Neighbor Cell (MAHO)).* In

order to obtain a non-empty table, the list of neighbor channels must be configured in the *Network* tab of the *Connect. Control* menu; see p. 4.90 ff.

Remote control	`[SENSe:]RXQuality:MAHO:NCELls?` `[SENSe:]RXQuality:MAHO:NCELl<nr>?`

Connection Control (Contd.)

The popup menu *Connection Control* controls the Signalling procedures (call setup and release, services, signalling parameters) and determines the inputs and outputs with the external attenuation values and the reference frequency.

As *Signalling* measurements are typically performed with a call connection to the mobile station, the first two tabs for setting up the call (*Connection Control – Signalling)* appear immediately after selection of the function group *IS 136 800/1900-MS Signalling* in the *Menu Select* menu. Alternatively, the *Connection Control* menu can be called up by pressing the softkey *Connect. Control* at the top right in every measurement menu; the individual tabs can be accessed via the hotkey bar at the lower edge of the screen. By pressing the *Escape* key, the *Connection Control* menu is closed and the CMU changes to the measurement mode.

The two tabs *Connection Control – Signalling* displayed immediately after the function group *IS 136 800/1900-MS Signalling* is activated are described at the beginning of section *TDMA Mobile Tests (Signalling* on p. 4.56 ff. The remaining tabs of the *Connection Control - Signalling* menu are described below.

Signalling Control in the Registered State

The popup menu *Signalling (Registered)* provides information on

- the current data of the mobile station *(Mobile registered)*,
- the status and result of the peak power measurement *(Power)*.

Besides, it contains softkeys which lead to other signalling states:

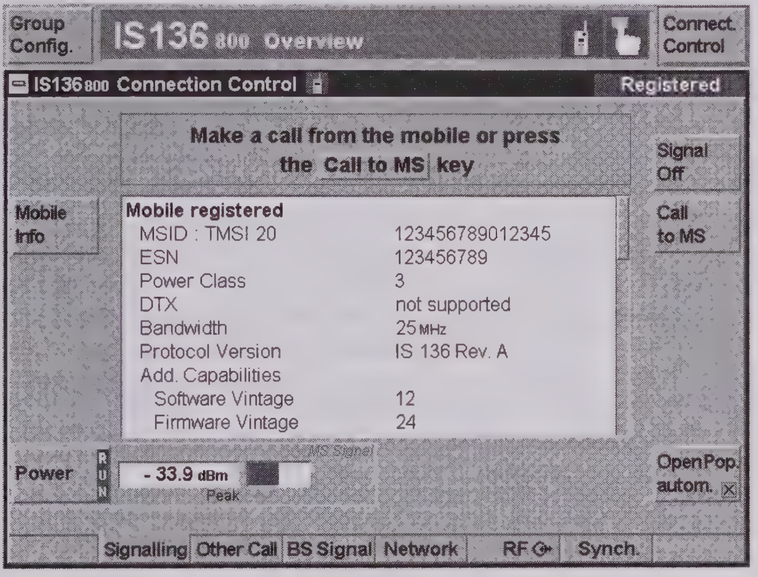
- Deactivation of the control channel signal for synchronization and call release to the mobile station *(Signal Off)*,
- Establishing a call to the mobile station (*Call to MS ->* state *Call Established),*

The popup menu *Signalling (Registered)* is opened when a successful call (in which case the mobile is considered as being registered) is released *(Call Release* softkey in the *Alerting* or in the *Call Established* state, MS call release, loss of radio link) or when registration is initiated by the mobile phone. It is replaced by the *Signalling (Alerting)* menu if the CMU initiates a call to the mobile phone (Softkey *Call to MS)*, or by the *Signalling (Call Established)* menu if the mobile phone initiates a call to the CMU, see Fig. 4-31.

Note: *If synchronization is lost during the operation (because of a low signal level etc.) the warning* Loss of radio link ! *will appear.*

At the same time, bit 2 is set in the STATus:OPERation register. The message window is closed after a while or after it is confirmed by pressing the ENTER *key.*

Connect. Control →



Make a call from the mobile or press the Call to MS key

Mobile registered

MSID : TMSI 20	123456789012345
ESN	123456789
Power Class	3
DTX	not supported
Bandwidth	25 MHz
Protocol Version	IS 136 Rev. A
Add. Capabilities	
Software Vintage	12
Firmware Vintage	24

Power: - 33.9 dBm

Fig. 4-43 Connection Control – Signalling (Registered)

The function of the *Power* softkey is described in the section *Signalling Control without Signal (State Signal Off)* on page 4.57, the softkey *Signal Off* in the section *Signalling Control with Signal (State Signal On)* on page 4.59.

Mobile Info The table *Mobile Info* indicates the mobile parameters transferred to the CMU in the registration. A selection of the signalling parameters appears also when the call has been established (see section *Signalling Control with Call Established* on page 4.81).

MSID Type of code number used to identify the mobile phone. Depending on the mobile phone, one of the following four MSID types may be used:

TMSI 20	20-bit Temporary Mobile Station Identity
TMSI 20	24-bit Temporary Mobile Station Identity
MIN	34-bit Mobile Station Identification Number
IMSI	50-bit International Mobile Subscriber Id. Number

Default values for all *MSID* types can be defined in the *Network* tab (see p. 4.90 ff)

ESN	32-bit Electronic Serial Number, to be sent with every signalling message (only on request; if the ESN is switched off in the *Requested Mobile Data* section of the *Network* tab described on page 4.90 ff, it is not transmitted so the signalling process is speeded up)
Power Class	Power class of the mobile, see Table 4-3 on page 4.68
DTX	Discontinuous transmission mode capability
Bandwidth	Width of the whole RF band used (either 20 MHz or 25 MHz for both the 800 MHz and the 1900 MHz hyperband)
Protocol Version	Protocol standard of the mobile phone

If it is requested in the *Connection Control – Network* menu (see page 4.90 ff), the *Capability Report* containing the following information on the mobile phone is displayed *(Add. Capabilities)*:

Software Vintage	Software version number
Firmware Vintage	Firmware version number

Model Number	Model number of mobile defined by the manufacturer
Manufacturer Code	Information element identifying the mobile station manufacturer
Max. Supp. PFC	Max. Paging Frame Class, interval between occurrences of a mobile's paging channel
SOC Support	Support of 12-bit System Operator Code used to identify a licensed service provider
BSMC Support	Support of 8-bit Base Station Manufacturer's Code used to identify the manufacturer of the network infrastructure
Async. Data Supp.	Support of asynchronous data service (digital circuit-switched data service)
G3 Fax Support	Support of group 3 fax service (digital circuit-switched data service)
SMS Broadcast S.	Support of broadcast short message service
Subaddressing S.	Support of subaddressing
Supported Freq. B.[2]	Support of the individual frequency bands listed in the two tables in section *Control of Input and Output Signals* on page 4.43 ff.
IRA Support	Support of IRA address encoding
800 MHz Ana. Sup.[1]	Analog speech support in the 800 MHz band (AMPS)
DTC Supp.	Support of full-rate, half-rate, double or triple-rate digital traffic channels
STU-III Supp.	Support of STU-III Secure Terminal Unit
Voice Coder Map	List of voice coders supported by the mobile (not provided by all mobiles)
Alternate SOC S.	12-bit system operator code used to identify the system provider

The *Capability Report* is transmitted on request every time the mobile station is switched on. If the *Capability Report* is switched off in the *Requested Mobile Data* section of the *Network* tab, the mobile phone doesn't transmit the information so the signalling process is speeded up.

Note on Other Call / Handoff Procedures:

The information on the *Supported Frequency Bands* and the *800 MHz Analog Support* reported by the mobile is used to check – and possibly restrict – the default destination network list for *Other Call* and *Handoff* procedures (see p. 4.83 ff). If the *Capability Report* is switched off, this information is only available after a call has been established.

Other Calls, which are always initiated in the *Registered* state, may fail if a destination network that is not supported by the mobile under test is selected. To exclude this, either the mobile station must be known or the capability report must be requested when the mobile is switched on (see *Requested Mobile Data* section of the *Network* tab).

Handoffs are always initiated in the *Call Established* state so that the destination network list displayed is correct. Moreover, the *Mobile Info* is stored and therefore available in the destination network, too.

Remote control `[SENSe:]MSSinfo:...?`

---

[2] See *Note on Other Call / Handoff Procedures* at the end of this paragraph.

Call to MS

The softkey *Call to MS* sets up a call to the mobile station.

A user prompt below the header indicates the function of this softkey. On pressing it the message *Paging in progress ...* is displayed below the header. As soon as the mobile responds (rings), the CMU changes to the signalling state *Alerting*. When the mobile is picked up, the CMU changes to the signalling state *Call Established*.

Remote control `PROCedure:Signalling:ACTion CTM`

Open Pop. autom. ☐

The softkey *Open Pop. autom.* contains a field which activates or suppresses the display of the popup menu *Signalling (Registered)*.

- In the default setting (*Open Pop. autom.* on), the popup menu is displayed each time the *Registered* state is reached (due to a change of the signalling state or function group).
- In the alternative setting (*Open Pop. autom.* off), the popup-menu is suppressed. Signalling may still be controlled, e.g., via the mobile. Moreover, the popup menu *Signalling (Registered)* can also be opened explicitly by pressing the corresponding hotkey in the menu group *Connection Control*.

Remote control –

Signalling Control in the Alerting State

The popup menu *Signalling (Alerting)* provides information on

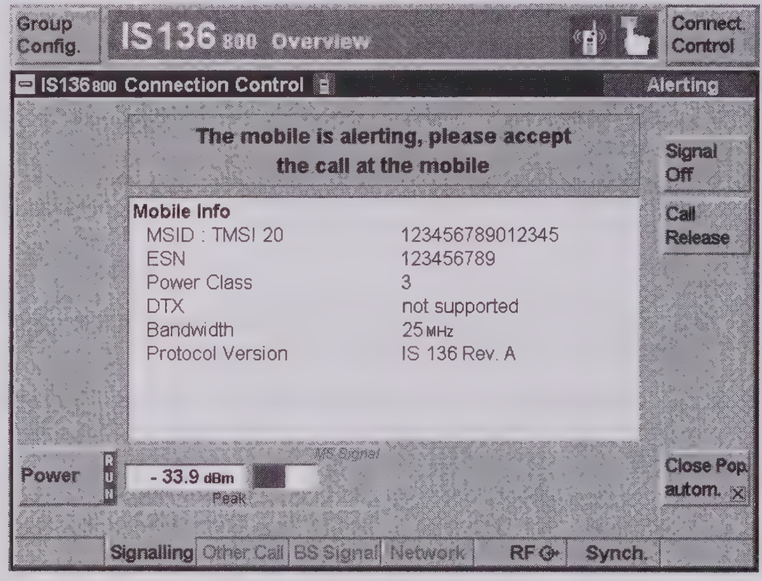
- The characteristics of the registered mobile station *(Mobile info)*
- The status and result of the peak power measurement *(Power)*

Besides, it contains softkeys which lead to other signalling states:

- Deactivation of the control channel signal for synchronization and call release *(Signal Off)*
- *Call Release* while keeping the control channel signal switched on (-> state *Registered)*

The popup menu *Signalling (Alerting)* is opened while the mobile phone is ringing during a call setup *(Call to MS* softkey in the *Signal On* or in the *Registered* state). It is replaced by the *Signalling (Call Established)* menu when the mobile phone accepts the call (is picked up*),* or by the *Signalling (Registered)* menu if the call is released *(Call Release* softkey, MS call release, alert timeout after 5 page messages, loss of radio link), see Fig. 4-31.

Connect. Control →


Group Config.
IS136 800 Overview
Connect. Control
IS136 800 Connection Control
Alerting
Signal Off
Call Release
Power
RUN
MS Signal
Peak
Close Pop. autom. ☒
Signalling
Other Call
BS Signal
Network
RF
Synch.

The mobile is alerting, please accept the call at the mobile

Mobile Info

MSID : TMSI 20	123456789012345
ESN	123456789
Power Class	3
DTX	not supported
Bandwidth	25 MHz
Protocol Version	IS 136 Rev. A

- 33.9 dBm

Fig. 4-44 Connection Control – Signalling (Alerting)

The function of the *Power* softkey is described in the section *Signalling Control without Signal (State Signal Off)* on page 4.57, the softkey *Signal Off* in the section *Signalling Control with Signal (State Signal On)* on page 4.59.

Mobile Info The table *Mobile Info* indicates the characteristics of the called mobile station. All parameters are already displayed in the *Registered* state and described on page 4.76 ff.

Remote control `SENSe:MSSinfo:...?`

Call Release

The *Call Release* softkey releases the call to the mobile station.

The CMU changes to the signalling state *Registered*.

Remote control `PROCedure:Signalling:ACTion CRELease`

Close Pop. autom. ☐

The softkey *Close Pop. autom.* contains a button which can be used to close the menu *Signalling (Alerting)* automatically when a call is set up.

- In the default setting (*Close Pop. autom.* on), the popup menu is closed as soon as the Signalling state *Alerting* is reached or a handoff is performed.
- In the alternative setting (*Close Pop. autom.* off), the popup-menu must be closed explicitly (e.g. via the *Escape* key) to continue the measurement.

Remote control –

Signalling Control with Call Established (Signalling State Call Established)

The popup menu *Signalling (Call Established)* provides information on

- A selection of signalling parameters of the mobile station *(Mobile Info)*
- The status and result of the peak power measurement *(Power)*

It contains softkeys which lead to other signalling states (see Fig. 4-31):

- Deactivation of the signal for synchronization and call release to the mobile station *(Signal Off)*
- Call release to mobile station (*Call Release* -> state *Registered)*

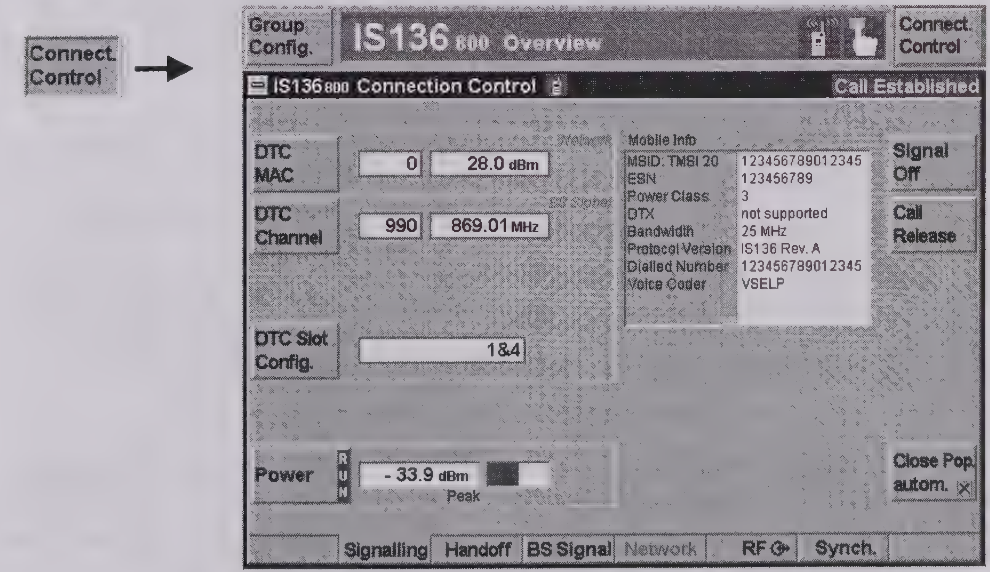
It permits the following network and signal parameters to be entered:

- Digital mobile attenuation code in the traffic channel *(DTC MAC)*
- Number and frequency of the traffic channel *(DTC Channel)*
- Time slot configuration in the DTC *(DTC Slot Config.)*

The popup menu *Signalling (Call Established)* is opened when a call is initiated by a mobile station which is already registered *(Signal On* or *Registered* state), or after a call initiated by the CMU is accepted by the mobile station. It is replaced by the *Signalling (Signal Off)* menu when the DCCH signal is switched off *(Signal Off* softkey) or if the mobile is switched off, or by the *Signalling (Registered)* menu if the call is released *(Call Release* softkey, MS call release, loss of radio link), see Fig. 4-31.

Note: *If the synchronization is lost during operation (because of a low signal level etc.) the warning* Loss of radio link ! *will appear.*

At the same time, bit 2 is set in the STATus:OPERation register. Prior to further operation, confirm the reception of the message by pressing the ENTER *key.*



DTC MAC: 0 | 28.0 dBm

DTC Channel: 990 | 869.01 MHz

DTC Slot Config.: 1&4

Power: - 33.9 dBm Peak

Mobile Info

MSID: TMSI 20	123456789012345
ESN	123456789
Power Class	3
DTX	not supported
Bandwidth	25 MHz
Protocol Version	IS136 Rev. A
Dialled Number	123456789012345
Voice Coder	VSELP

Fig. 4-45 Connection Control – Signalling (Call Established)

The function of the softkeys *Signal Off* and *Power* is described in the section *Signalling Control without Signal* on page 4.57. The softkeys Call Release and Close Pop. autom. are described in the previous section, *Signalling Control in the Alerting State*.

The *Network* panel contains the *DTC MAC* softkey.

DTC MAC

The *DTC MAC* softkey sets the mobile attenuation code.

The DTC MAC can be entered either as a dimensionless number or a maximum output power in dBm. For a definition of the MAC scale and the corresponding maximum output powers see Table 4-3 on page 4.68.

Remote control `PROCedure:SIGNalling[:DTC]:MAC   0 to 10`

IS 136 mobile phones are divided into different power classes according to their maximum output power: The nominal Effective Radiated Power *(ERP)* of a mobile (which is the average power of the mobile while in digital mode) depends on both its power class and the MAC. The ERP values and the tolerance limits in the following table are taken from the TIA/EIA standard.

Table 4-3 IS 136 Power classes and mobile attenuation codes (MAC)

MAC	**ERP in dBm, IS 136 800**				**Tolerance in dB**	**ERP in dBm, IS 136 1900**		**Tolerance in dB**
	Class I	**Class II**	**Class III**	**Class IV**		**Class II**	**Class IV**	
0	36	32	28	28	+2 / –4	30	28	+2 / –4
1	32	32	28	28	+2 / –4	30	28	+2 / –4
2	28	28	28	28	+2 / –4	28	28	+2 / –4
3	24	24	24	24	+2 / –4	24	24	+2 / –4
4	20	20	20	20	+2 / –4	20	20	+2 / –4
5	16	16	16	16	+2 / –4	16	16	+2 / –4
6	12	12	12	12	+2 / –4	12	12	+2 / –4
7	8	8	8	8	+2 / –4	8	8	+2 / –4
8	8	8	8	4 ± 3 dB	+2 / –6	4 ± 3 dB	4 ± 3 dB	+2 / –6
9	8	8	8	0 ± 6 dB	+2 / –6	0 ± 6 dB	0 ± 6 dB	+2 / –6
10	8	8	8	–4 ± 9 dB	+2 / –6	–4 ± 9 dB	–4 ± 9 dB	+2 / –6

The panel *BS Signal* combines two softkeys which are used for configuration of the CMU's signals.

DTC Channel

The *DTC Channel* softkey determines the number of the digital traffic channel.

The parameters for the traffic channel are described in summary in section *Signal Parameters (States Signal Off/On, Registered)* on page 4.87. For an overview of IS 136 channels see section *Control of Input and Output Signals* on page 4.43.

Remote control `PROCedure:SIGNalling[:DTC]:CHANnel   <Channel>`

DTC Slot Config.

The *DTC Slot Config.* softkey specifies the two timeslots of a TDMA frame which are paired to form a full-rate TDMA channel.

A full-rate TDMA channel is composed of a timeslot pair separated by 20 ms so that the combinations 1&4, 2&5, and 3&6 are allowed.

Remote control `PROCedure:SIGNalling[:DTC]:SLOTconfig C14| C25 | C36`

Mobile Info	The table *Mobile Info* indicates the characteristics of the connected mobile station:

Dialed Number	Number dialed at the mobile station (Call from MS),
Voice Coder	Vocoder model of the mobile station.

The remaining parameters are already displayed in the *Registered* state and described on page 4.76 ff.

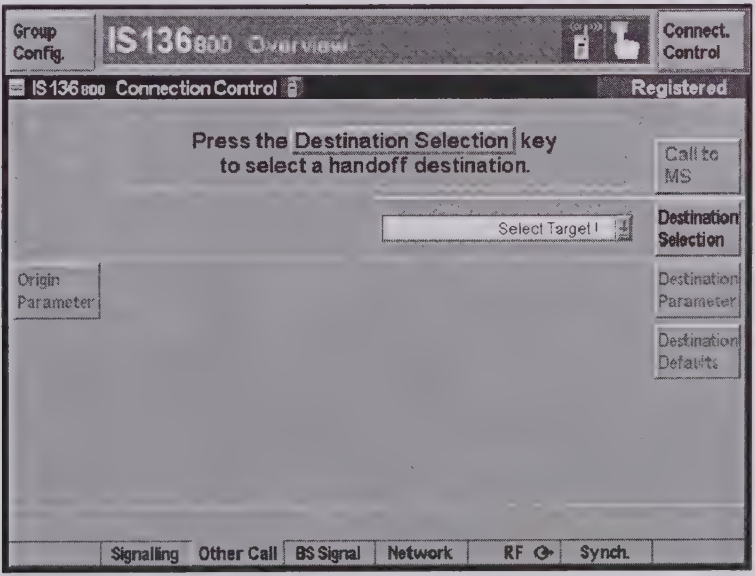
Remote control `[SENSe:]MSSinfo...`

Call to Another Network (Connection Control – Other Call)

The *Other Call* tab sets up a call from the current *(Origin)* to a different *(Destination)* network. While the call is still set up in the origin network (via DCC), the traffic channel is in the destination network (via DTC). Therefore, in contrast to a *Handoff* procedure (see p. 4.85), an *Other Call* is possible in the *Signal On* or *Registered* signalling states only. The call process includes:

- Selection of the target network *(Destination Selection)* and special parameters of this network *(Destination Parameter, Destination Defaults)*
- Start of the call procedure *(Call to MS)*
- Return to of the original network *(Origin Parameter)*

Connect. Control →


Group Config.
IS 136 800 Overview
Connect. Control
IS 136 800 Connection Control
Registered
Call to MS
Select Target !
Destination Selection
Origin Parameter
Destination Parameter
Destination Defaults
Signalling
Other Call
BS Signal
Network
RF
Synch.

Press the Destination Selection key to select a handoff destination.

Fig. 4-46 Connection Control – Other call (destination selection)

Destination Selection

The softkey *Destination Selection* selects the target network for the call.

If the current function group corresponds to one of the two IS 136 bands, the default list of target networks contains the other IS 136 band and to the analog AMPS network. Furthermore, an *Other Call* destination with fallback (e.g. *AMPS (Fallback))* means that the CMU returns to the function group of the origin network after the call is released. The target network list may be restricted if the mobile under test does not support all target networks.

Note: *The* Destination Selection *list is automatically adapted to the connected mobile when the mobile* Capability Report *is received (parameters* Supported Freq. B. *and* 800 MHz Ana. Sp. Support, *see description of*

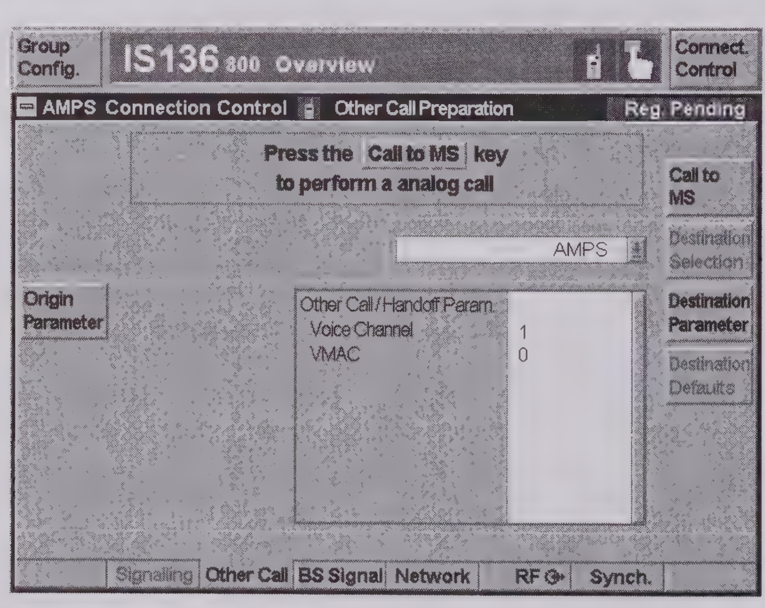
Mobile Info *table on page 4.77. If the* Capability Report *is not requested (see section* Network Parameters (Connection Control – Network) *on page 4.90), the full (default) list is displayed and care must be taken to select a target network supported by the mobile.*

Once the selection of the target network is confirmed via *Enter,* the CMU changes to the *Reg. Pending* signalling state. In this state, the entire *Connection Control* menu is mapped onto the target function group, so it is possible to edit the *Destination Parameters* (see below), the *BS Signal*, and the *Network* parameters of the target network.

Remote control

```
STATus:HANDover:TARGet:LIST?
CONFigure:HANDover:TARGet <Target>
```

Note: Reg. Pending *is an intermediate signalling state that only occurs in the context of an Other Call process and is therefore not shown in Fig. 4-31 (page 4.57). For a complete overview of signalling states see Fig. 6.1 in chapter 6 of this manual.*


Group Config.
IS136 800 Overview
Connect. Control
AMPS Connection Control
Other Call Preparation
Reg. Pending
Call to MS
Destination Selection
Origin Parameter
Destination Parameter
Destination Defaults
Signalling
Other Call
BS Signal
Network
RF
Synch.

Press the Call to MS key to perform a analog call

AMPS

Other Call / Handoff Param.	
Voice Channel	1
VMAC	0

Fig. 4-47 Connection Control – Other Call (destination network preparation)

Destination Parameter

The *Destination Parameter* softkey sets important target network parameters that come into effect as soon as the call is established.

The entries depend on the target network selected via *Destination Selection*. For IS 136 destination networks, the following list is provided:

DTC Channel	Number of the digital traffic channel used in the destination network.
Slot Configuration	Numbers of two timeslots (1&4, 2&5, 3&6) that will be combined to form a full-rate TDMA channel.
DTC MAC	Mobile attenuation code (set at the mobile), see Table 4-3 on page 4.68.

More destination parameters can be set in the *BS Signal* (see p. 4.87 ff) and the *Network* tabs (see p. 4.90 ff).

Remote control

```
CONFigure:BSSignal:OCHandoff[:DTC]:CHANnel <Channel>
CONFigure:BSSignal:OCHandoff[:DTC]:SLOTconfig C14 | C25 | C36
CONFigure:NETWork:OCHandoff[:MS]:DTCmac <MAC>
```

Destination Defaults

The *Destination Defaults* softkey resets all changed *Destination Parameters* to default values.

The softkey is disabled if no changes have been made in the *Destination Parameter* list.

Remote control

```
CONFigure:BSSignal:OCHandoff[:DTC]:CHANnel DEF
CONFigure:BSSignal:OCHandoff[:DTC]:SLOTconfig DEF
CONFigure:NETWork:OCHandoff[:MS]:DTCmac DEF
```

Call to MS

The *Call to MS* initiates the call to the target network.

Remote control

```
PROCedure:SIGNalling:ACTion HANDoff
```

Origin Parameter

The *Origin Parameter* softkey cancels the *Other Call* and resets the CMU to the previous signalling state *(Signal On* or *Registered; see* Fig. 4-46*)*.

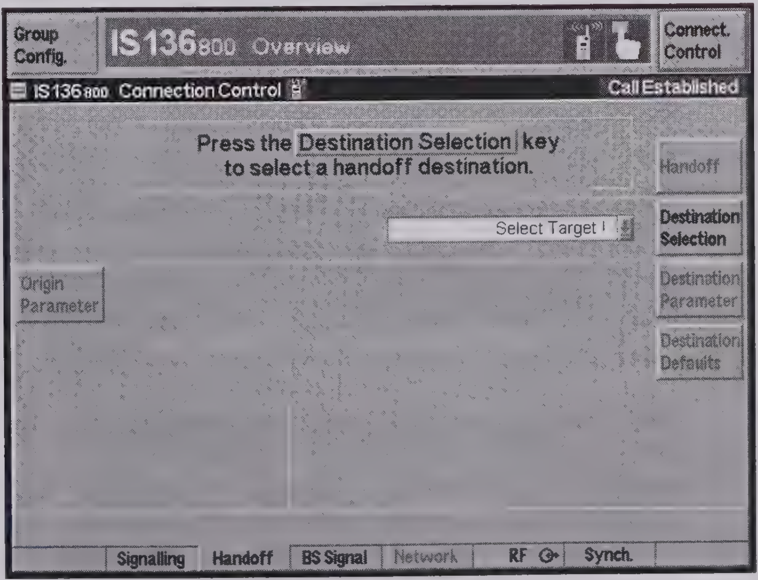
The destination parameters set in the *Reg. Pending* state are maintained. To drop the *Other Call* and return to the measurement mode, press the *ESCAPE* key or the *Connection Control* softkey.

Handoff to another Network (Connection Control – Handoff)

The *Handoff* tab initiates a handoff of the call connection to a different network. It is therefore available in the *Call Established* signalling state only. The handoff process includes:

- Selection of the target network *(Destination Selection)* and the handoff parameters *(Destination Parameter, Destination Defaults)*
- Start of the handoff procedure *(Handoff)*
- Return to the original network *(Origin Parameter)*

Connect. Control →


Group Config.
IS136 800 Overview
Connect. Control
IS136 800 Connection Control
Call Established
Select Target
Handoff
Destination Selection
Destination Parameter
Destination Defaults
Origin Parameter
Signalling
Handoff
BS Signal
Network
RF
Synch.

Press the Destination Selection key to select a handoff destination.

Fig. 4-48 Connection Control – Handoff (destination selection)

Destination Selection

The softkey *Destination Selection* selects the target network for handoff.

If the origin network is one of the two IS 136 bands, the default list of target networks contains the other IS 136 band and to the analog AMPS network. Furthermore, a *Handoff* destination with fallback (e.g. *AMPS (Fallback))* means that the CMU returns to the function group of the origin network after the call is released. The target network list may be restricted if the mobile under test does not support all target networks.

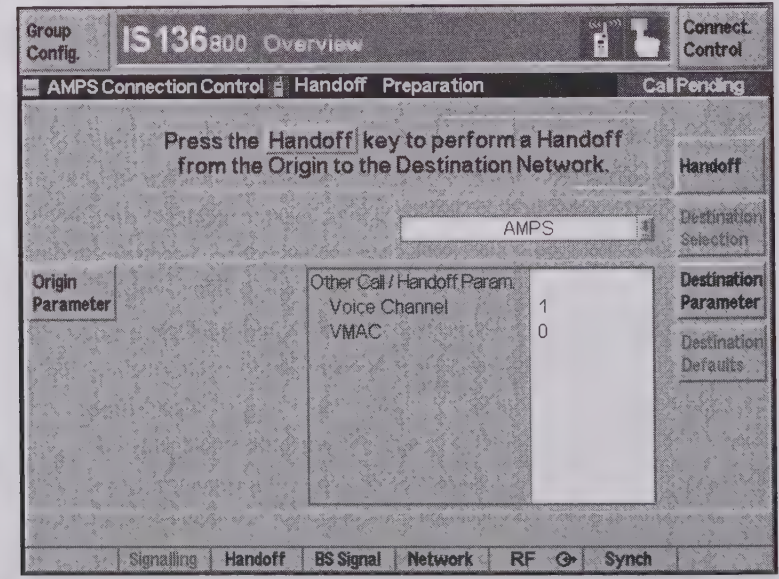
Note: *The* Destination Selection *list is automatically adapted to the connected mobile (parameters* Supported Freq. B. *and* 800 MHz Ana. Sp. Support *in the* Capability Report, *see description of* Mobile Info *table on page 4.77.*

Once the selection of the target network is confirmed via *Enter,* the CMU changes to the *Call Pending* signalling state. In this state, the entire *Connection Control* menu is mapped onto the target function group, so it is possible to edit the *Destination Parameters* (see below), the *BS Signal*, and the *Network* parameters of the target network.

Remote control

```
STATus:HANDover:TARGet:LIST?
CONFigure:HANDover:TARGet <Target>
```

Note: Call Pending *is an intermediate signalling state that only occurs in the context of a handoff process and is therefore not shown in Fig. 4-31 (page 4.57). For a complete overview of signalling states see Fig. 6.1 in chapter 6 of this manual.*


Group Config.
IS 136 800 Overview
Connect. Control
AMPS Connection Control
Handoff Preparation
Call Pending
Handoff
Destination Selection
AMPS
Origin Parameter
Destination Parameter
Destination Defaults
Signalling
Handoff
BS Signal
Network
RF
Synch

Press the Handoff key to perform a Handoff from the Origin to the Destination Network.

Other Call / Handoff Param
Voice Channel 1
VMAC 0

Fig. 4-49 Connection Control – Handoff (destination network preparation)

Destination Parameter

The *Destination Parameter* softkey sets important target network parameters that come into effect as soon as the call is handed off.

The entries depend on the target network selected via *Destination Selection*. For IS 136 destination networks, the following list is provided:

DTC Channel	Number of the digital traffic channel used in the destination network.

Slot Configuration	Numbers of two timeslots (1&4, 2&5, 3&6) that will be combined to form a full-rate TDMA channel.
DTC MAC	Mobile attenuation code (set at the mobile), see Table 4-3 on page 4.68.

More destination parameters can be set in the *BS Signal* (see p. 4.87 ff) and the *Network* tabs (see p. 4.90 ff).

Remote control

```
CONFigure:BSSignal:OCHandoff[:DTC]:CHANnel <Channel>
CONFigure:BSSignal:OCHandoff[:DTC]:SLOTconfig C14 | C25 | C36
CONFigure:NETWork:OCHandoff[:MS]:DTCmac <MAC>
```

Destination Defaults

The *Destination Defaults* softkey resets all changed *Destination Parameters* to default values.

The softkey is disabled if no changes have been made in the *Destination Parameter* list.

Remote control

```
CONFigure:BSSignal:OCHandoff[:DTC]:CHANnel DEF
CONFigure:BSSignal:OCHandoff[:DTC]:SLOTconfig DEF
CONFigure:NETWork:OCHandoff[:MS]:DTCmac DEF
```

Handoff

The *Handoff* initiates handoff to the target network.

Remote control

```
PROCedure:SIGNalling:ACTion HANDover
```

Origin Parameter

The *Origin Parameter* softkey cancels the *Handoff* procedure and resets the CMU to the *Call Estabished* signalling state (see Fig. 4-48).

The destination parameters set in the *Call Pending* state are maintained. To drop the *Handoff* procedure and return to the measurement mode, press the *ESCAPE* key or the *Connection Control* softkey.

Signals of the CMU (Connection Control – BS Signal)

The popup menu *BS Signal* configures the signals of the CMU (which simulates a base station transmitting a control channel (DCCH) and a traffic channel (DTC) signal), selects the speech coder and transmit data. The functionality of the menu depends on the signalling state:

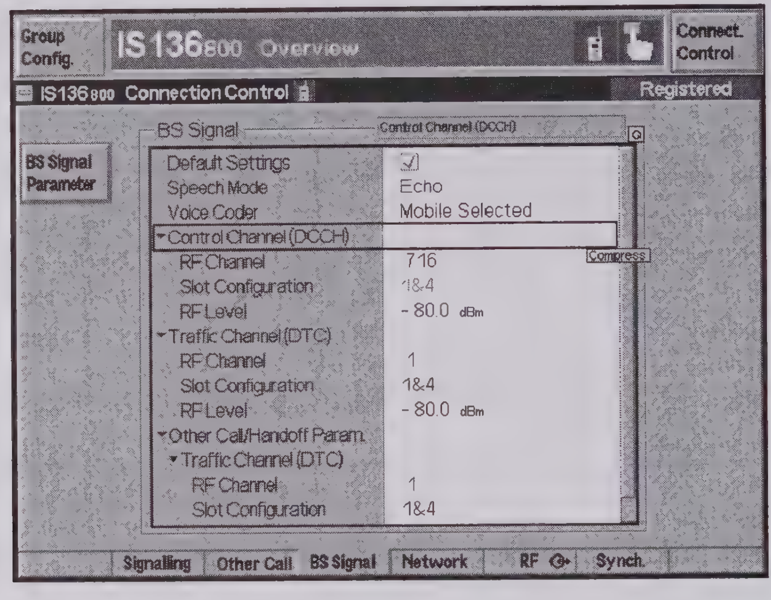
- Most signal parameters must be set before a call is set up to the mobile station. They are available in the signalling states *Signal Off, Signal On* and *Registered*.
- The DTC level and the speech mode can still be changed after the call has been set up, i.e. in the Signalling state *Call Established*.

Signal Parameters (States Signal Off/On, *Registered*)

The popup menu *BS Signal (Signal On)* configures the signals of the CMU. This includes:

- Selection of the loop-back mode *(Speech Mode)* and the voice coder
- The parameters of the control and traffic channels
- For processes switching between different networks, the traffic channel parameters in the destination network *(Other Call/Handoff Parameters).*

Connect. Control →



BS Signal — Control Channel (DCCH)

Default Settings	☑
Speech Mode	Echo
Voice Coder	Mobile Selected
▾Control Channel (DCCH)	
RF Channel	716
Slot Configuration	1&4
RF Level	- 80.0 dBm
▾Traffic Channel (DTC)	
RF Channel	1
Slot Configuration	1&4
RF Level	- 80.0 dBm
▾Other Call/Handoff Param.	
▾Traffic Channel (DTC)	
RF Channel	1
Slot Configuration	1&4

Fig. 4-50 Connection Control – BS Signal (Signal On)

BS Signal Parameter

The softkey *BS Signal Parameter* activates the input of parameters for the signals sent by the CMU.

The control and traffic channels are configured separately. Besides, the voice coder and the speech mode can be selected.

Default Settings

The *Default Settings* switch assigns default values to all parameters of the popup menu *BS Signal*. See command description in chapter 6 of this manual.

Remote control –

Speech Mode

The parameter *Speech Mode* determines how the CMU returns the data transmitted over the traffic channel to the mobile. This parameter is relevant for testing the quality of a call.

Echo	Loop-back mode with delay. The CMU sends back all data received on the DTC after 25 TDMA frames, corresponding to 1 s (50 timeslots for full-rate channels). If the CMU does not receive speech data in this operating mode, a bit pattern is automatically sent, producing “silence” in the receiver of the mobile station.
Loop	Loop-back mode with minimum delay: The CMU sends back all data received on the DTC after 20 ms.

Remote control `CONFigure:BSSignal:SPEech  ECHO | LOOP`

Voice coder

The parameter *Voice Coder* specifies the voice coder used by the CMU. Either a specific model *(ACELP, VSELP)* or the preferred voice coder of a mobile under test that supports several voice coders *(Mobile Selected)* can be selected.

If a voice coder that is not supported is selected, the CMU displays a warning message, switches over to a supported voice coder, and is ready to set up the call. The voice coder selection does not affect any of the measurement results.

Remote control `CONFigure:BSSignal:VCODer  ACELp | VSELp | MSELected`

Control channel / Traffic channel The sections *Control Channel (DCCH)* and *Traffic Channel (DTH)* define the channel number, RF level and slot configuration of the control and traffic channel signals generated by the CMU. See section *Signalling Control with Call Established* on page 4.81.

Remote control `CONFigure:BSSignal:DCCH:...`
`CONFigure:BSSignal[:DTC]...`

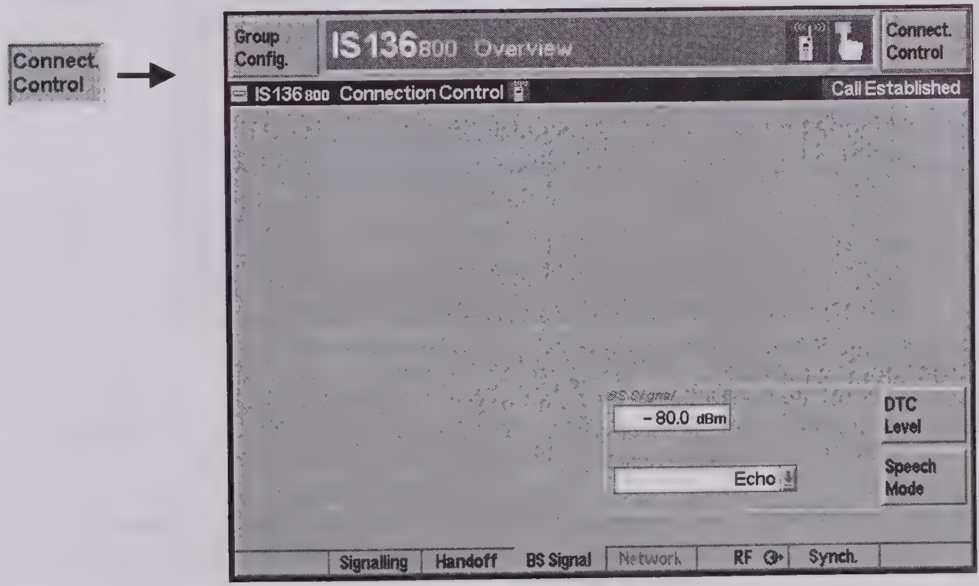
Other Call / Handoff Parameter The *Other Call / Handoff Parameter* section defines the *DTC* parameters of the mobile in the current network, which come into effect if the call is set up or handed off from another network; see sections *Call to Another Network (Connection Control – Other Call)* on page 4.83 and Handoff to another Network (Connection Control – Handoff) on page 4.85.

This can be used to set parameters that are relevant for a call connection without actually setting up a call.

Remote control `CONFigure:BSSignal:OCHandoff...`

Signal Parameters (State Call Established)

The popup menu *BS Signal (Call Established)* allows to change the level of the traffic channel (DTC Level) and the *Speech Mode* while a call connection is established.


Connect. Control
Group Config.
IS136 800 Overview
Connect. Control
IS136 800 Connection Control
Call Established
DTC Level
Speech Mode
Signalling
Handoff
BS Signal
Network
RF
Synch.

BS Signal
-80.0 dBm
Echo

Fig. 4-51 Connection Control – BS Signal (Call Established)

All settings are explained in the previous section (section Signal Parameters (States Signal Off/On, *Registered*) on page 4.87.

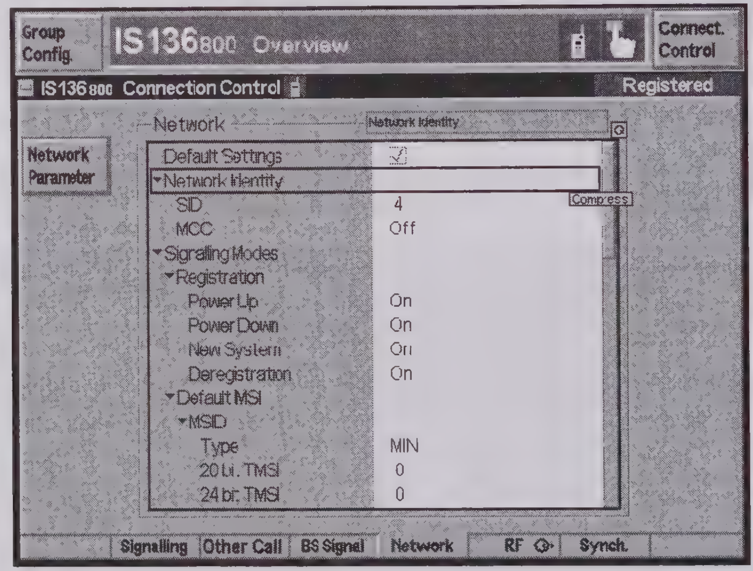
Network Parameters (Connection Control – Network)

The popup menu *Network* defines various parameters of the network and the mobile station. This includes

- Parameters characterizing the network *(Network Identity)*
- Control parameters for Registration and default IMSI *(Signalling Modes)*
- Parameters of the mobile station that are requested by the CMU during registration or when a call is delivered *(Requested Mobile Data)*
- Parameters characterizing the mobile phone *(Mobile Settings)*
- *System Parameters*
- *Timeouts*
- For processes switching between different networks, traffic channel parameters in the destination network *(Other Call/Handoff Parameter).*

This menu is not available in the *Alerting* signalling state.

Connect. Control →



Default Settings ☑
Network Identity
SID 4
MCC Off
Signaling Modes
Registration
Power Up On
Power Down On
New System On
Deregistration On
Default MSI
MSID
Type MIN
20 bi. TMSI 0
24 bi. TMSI 0

Fig. 4-52 Connection Control – Network parameters

Network Parameter

The *Network Parameter* softkey activates the associated table for entering or selecting various parameters of the network and the mobile station.

Network Identity

The field *Network Identity* contains parameters identifying the radio network:

SID	2-digit system identity (coded as 15 bits) used to identify the service provider
MCC	3-digit mobile country code.

Remote control

`CONFigure:NETWork:IDENtity:SID <MCC>`
`CONFigure:NETWork:IDENtity:MCC <MNC>`

Signalling Modes

The *Signalling Modes* field determines signalling parameters that are sent to the mobile station by the CMU and that control its function (the parameters for CMU signals, on the other hand, are set in the popup menu BS-Signal, see section Signal Parameters (States Signal Off/On, Registered) on page 4.87). The parameters refer to:

- *Registration,*
- Input of a mobile subscriber identity *(Default IMSI).*

Registration

The section *Registration* defines when a registration procedure is to be executed. All of the following registration type parameters can be switched *On* and *Off*:

Power up	Registration on power-up of the mobile,
Power down	Registration on power-down of the mobile,
New System	Registration on change in SID,
Deregistration	Registration on change to other DCCH (in the network, in order to switch over to another BTS).

Registration is the process by which the mobile phone identifies itself to the network and makes itself available for service. Registration may be in order in many cases where the operating mode of the mobile is changed; typical registration types are given in the parameter list above.

In practice, when the mobile encounters a registration type, it checks whether the associated registration parameter is set. If this is true, it sends a registration message including the registration type to the network. The network may either accept or reject registration.

After successful registration of the mobile phone under test, the CMU passes on to the signalling state *Registered*.

Remote control

```
CONFigure:NETWork:SMODe:PUReg  ON | OFF
CONFigure:NETWork:SMODe:PDReg  ON | OFF
CONFigure:NETWork:SMODe:SYReg  ON | OFF
CONFigure:NETWork:SMODe:DEReg  ON | OFF
```

Default IMSI / MSID

The section *Default IMSI/MSID* defines the mobile station identity (MSID) which is used as a default value during call setup to the mobile. The type of MSID to be used is selected in the *Type* field first:

TMSI	20- or 24-bit temporary mobile station identity
MIN	34-bit mobile identification number
IMSI	50-bit international mobile subscriber identity in the format MCC.MNC.MSIN where

MCC	3-digit mobile country code,
MNC	2-digit mobile network code,
MSIN	10-digit mobile subscriber id. no.

The default setting enables a call to a mobile station with known MSID which is not registered yet. If the MSID is not known, a call can still be set up from the mobile. In this case (and if the mobile initiates a registration, see above) the actual MSID of the mobile station supersedes the default MSID as soon as it is transferred to the tester (see also *Mobile Info* table on page 4.77).

Remote control

```
CONFigure:NETWork:SMODe:ID<nr>   <TMSI>
CONFigure:NETWork:SMODe:IDMin   <MIN>
CONFigure:NETWork:SMODe:IDIMsi   <IMSI>
```

Requested Mobile Data

The field *Requested Mobile Data* determines the signalling parameters of the mobile station to be requested during registration and displayed in the *Connection Control – Signalling (Registered)* menu (see page 4.76 ff):

Serial Number	Request of the mobile's serial number *(On)* or no request *(Off)*.
Capability	Request of the mobile's capability report *(On)* or no request *(Off)*.

The *Capability Report* contains a list of all networks supported by the mobile (see *Mobile Info* table on page 4.77), which supersedes the *Destination Network* list in the *Other Call* (see p. 4.83) and *Handoff* (see p. 4.85) tabs. To avoid an erroneous destination selection, it is recommendable to request the *Capability Report* before initiating an *Other Call*.

Remote control

```
CONFigure:NETWork:REQuest:SNUMber  ON | OFF
CONFigure:NETWork:REQuest:CAPability  ON | OFF
```

Mobile Settings

The field *Mobile Settings* sets transmit parameters of the mobile station. These include

- The output power of the mobile station *(MAC)*
- The control channel selection parameters *SS SUFF, RSS ACC MIN, Scan Interval, Delay*
- The DCCH burst type transmitted after handoff *(Shortened Burst Indicator)*
- The operating mode *DTX (discontinuous transmission)*

DCCH MAC / DTC MAC

The MAC levels *(mobile attenuation code)* determine the output power (for both the DCCH and DTC) at which the mobile station sets up a call to the network and performs a registration. The MAC scale defined in the TIA/EIA standard is listed in section *Signalling Control with Call Established* on page 4.81 ff.

Remote control

```
CONFigure:NETWork[:MS]:DCCMac  <MAC>
CONFigure:NETWork[:MS]:DTCMac  <MAC>
```

DIC Application Domain

The parameter *DIC Application Domain* determines whether DIC (delay interval compensation) is applied in traffic channel (DTC) or control channels (DCCH).

Remote control

```
CONFigure:NETWork[:MS]:DIC  DCCH | DTC
```

SS SUFF

The parameter *SS SUFF* defines the received signal strength from a preferred candidate DCCH above which the mobile may reselect to it, or the received signal strength on the current DCCH below which the mobile may reselect to another control channel. According to the standard, the permissible range of values is –111 dBm to –51 dBm in 2 dB steps, and – ∞ (channel reselection switched off).

Remote control

```
CONFigure:NETWork[:MS]:SUFF  <Suff>
```

RSS ACC MIN

The parameter *RSS ACC MIN* defines the minimum received signal strength at the mobile required to access a DCCH. According to the standard, the permissible range of values is –111 dBm to –51 dBm in 2 dB steps, and – ∞ (DCCH access always possible).

Remote control

```
CONFigure:NETWork[:MS]:RAMin  <Level>
```

Scan Interval

The parameter *Scan Interval* defines an interval between two consecutive signal strength measurements on candidate control channels for reselection purposes. According to the standard, the scan interval may range between 1 and 16 hyperframes.

Remote control

```
CONFigure:NETWork[:MS]:SCANinterval  <Interv>
```

Delay

The parameter *Delay* defines a minimum period of time the mobile must obtain service on the current DCCH before considering DCCH reselection. According to the standard, the permissible range is 0 to 105 superframes (in 15-superframe steps) and 105 to 420 superframes (in 45-superframe steps).

Remote control

```
CONFigure:NETWork[:MS]:DELay  <Delay>
```

Shortened Burst Indicator

The parameter *Shortened Burst Indicator* specifies which DCCH burst type (normal burst or shortened burst) is transmitted after a handoff. See figures in section *Limit Lines* on page 4.13 ff and section *Measurement menu Power* on page 4.62 ff.

Remote control

```
CONFigure:NETWork[:MS]:SBINdicator  NORMal | SHORtened
```

System Parameters

The field *System Parameters* determines the following parameters for the radio link:

No. of FBCCH Slots	Number of *Fast Broadcast Control Channel (FBCCH)* slots per superframe (equal to 16 TDMA frames). 5 to 10 slots may be allocated.
No. of EBCCH Slots	Number of *Extended Broadcast Control Channel (EBCCH)* slots per superframe. According to the standard, 1 to 8 slots may be allocated.
Color Code SAT DVCC	Digital verification color code used to identify both the DCCH and the DTC for call setup and voice (de)coding.

Remote control

```
CONFigure:NETWork:SYSTem:NOFSlots  <Slots>
CONFigure:NETWork:SYSTem:NOESlots  <Slots>
CONFigure:NETWork:SYSTem:CCSDvcc  <Slots>
```

Timeouts

The *Timeouts* field defines timeouts after which the CMU drops an interrupted radio link or forces a registration of the mobile:

Loss of Radiolink	Time (in s) after which the CMU drops an established, but interrupted connection (e.g. due to low signal level).
Registration Period	Time period in s after which the CMU forces the mobile station to (re-)register (or *Off,* for no forced registration). With forced registration, it is possible to return to the *Registered* state automatically if the BS signal is temporarily switched off.

Time limits are of particular importance in remote-control mode. For example, the remote-control program will not be able to continue if the keyboard of the mobile station is defective and the mobile is not able to answer the call.

Remote control

```
CONFigure:NETWork:TIMeout:RORLink  <Time>
CONFigure:NETWork:TIMeout:RPERiod  <Time>
```

Neighbor Channels

The *Neighbor Channels* field defines a maximum of 24 traffic channel numbers in the neighbor cells. The mobile measures the RSSI on these neighbor channels and reports them to the tester (MAHO report, see section *Receiver Quality Measurements* on page 4.74 ff.

Remote control

```
CONFigure:NETWork:NCDef:CELL<nr> <Channel>
CONFigure:NETWork:NCDef:CCDef <Channel>{,<Channel>}
```

Other Call / Handoff Parameter

The *Other Call / Handoff Parameter* section defines the *DTC MAC* of the current network, which comes into effect if the call is set up or handed off from another network; see sections *Call to Another Network (Connection Control – Other Call)* on page 4.83 and *Handoff to another Network (Connection Control – Handoff)* on page 4.85.

This can be used to set parameters that are relevant for a call connection without actually setting up a call.

Remote control

```
CONFigure:NETWork:OCHandoff[:MS]:DTCMac <MAC>
```

RF Connectors (Connection Control – Connector/Ext. Att.)

The popup menu ↔*/Ext. Att.* selects the connectors for RF signals. This includes determination of

- RF input and RF output at the CMU *(RF Output, RF Input)*,
- An external attenuation at the connectors *(Ext. Att. Output, Ext. Att. Input)*.

The functions of this menu are described in the section *IS 136 800/1900-MS Non Signalling* on page 4.49.

Reference Frequency (Connection Control – Synch.)

The popup menu *Synch.* determines the reference signal for synchronization. This includes

- The selection of internal or external reference frequency,
- The output mode for the reference frequency *(F REF OUT 2)*.

The functions of this menu are described in the section *IS 136 800/1900-MS Non Signalling* on page 4.51.

Group Configuration

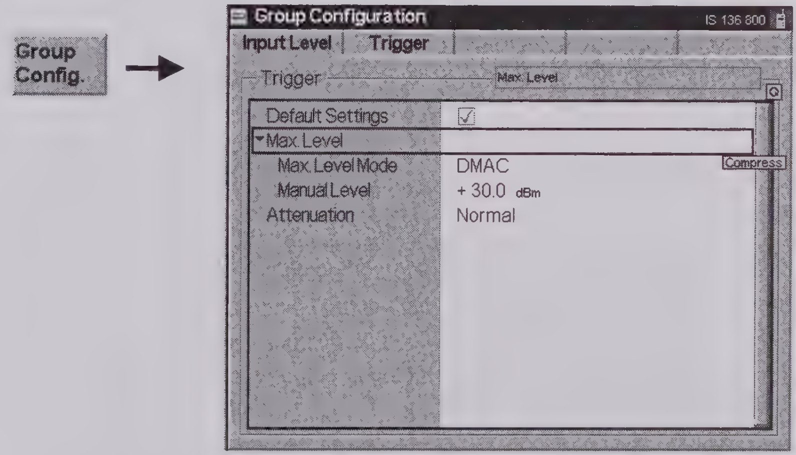
The popup menu *Group Configuration* contains two tabs that configure the function group *IS 136 800-MS Signalling* globally, i.e., it provides settings that are valid for all measurement menus within the function group. Most of these settings can be overwritten in the individual graphical measurement menus using softkeys and popup input fields.

The popup menu *Group Configuration* is activated by pressing the softkey *Group Config.* at the top left of each measurement menu. Pressing of the associated hotkeys permits to change between the tabs.

Input Level (Group Configuration – Input Level)

The tab *Input Level* provides general settings for the measured input level (see also section "Connection Control"):

- *Reference*
- *Max. Level*
- *Attenuation* or gain



Default Settings ☑
Max. Level
Max. Level Mode DMAC
Manual Level + 30.0 dBm
Attenuation Normal

Fig. 4-53 Group Configuration – input level

The functions of this menu are described in the section *IS 136 800/1900-MS Non Signalling* on page 4.53. Note that here, in contrast to the *Non Signalling* mode, the input level can be set corresponding to the DMAC of the connected mobile phone.

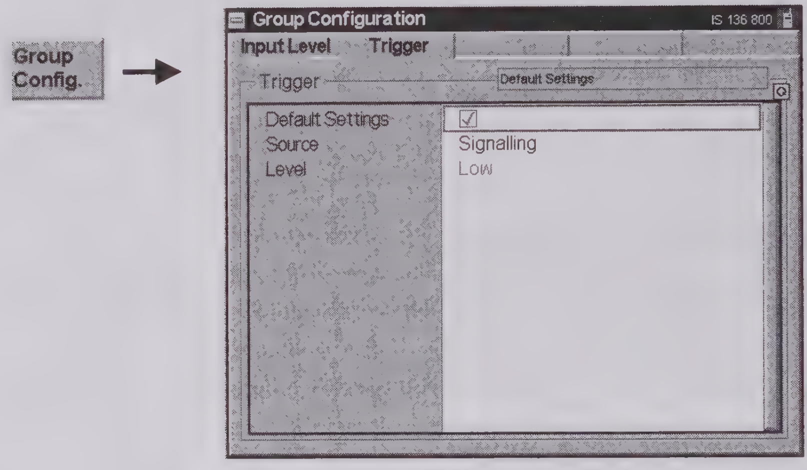
Max Level – Mode The *Reference* field sets the input attenuator and thus determines the maximum input level and the upper limit of the diagram in the graphical menu *Power vs Time*.

Manual	Manual input of maximum input level
DMAC	Input level corresponding to the digital mobile attenuation code of the mobile station.

Remote control `[SENSe:]LEVel:MODE MANual | DMAC`

Trigger (Group Configuration – Trigger)

The tab *Trigger* defines the trigger condition.



Default Settings	☑
Source	Signalling
Level	Low

Fig. 4-54 Group Configuration – Trigger

Default The field *Default* assigns the default setting to all fields of the tab *Trigger*.

Remote control `CONFigure:TRIGger:DEFault ON | OFF`

Trigger The *Trigger* field determines which type of time synchronization is used for the measurement:

Signalling	Trigger signal from the signalling unit of the CMU
RF Power	Triggering on the power (rising edge) of the incoming burst, broad-band trigger
IF Power	Narrow-band trigger
Free Run	Triggering via TDMA timing (synchronization information in the synchronization pattern)

Triggering via an external signal is only possible in the *Non Signalling* mode.

Remote control `TRIGger[:SEQuence]:SOURce FRUN | RFPower | IFPower`

Level The *Trigger Level* field determines the trigger threshold if the measurement is triggered by the *RF Power* or *IF Power*.

The trigger threshold is the level at which the trigger signal starts triggering. With the trigger sources *Free Run* or *Signalling* the *Trigger Level* field is disabled.

Low	Low trigger level equal to the reference level – 26 dB
Medium	Medium trigger level equal to the reference level – 16 dB
High	High trigger level equal to the reference level – 6 dB

Remote control `TRIGger[:SEQuence]:THReshold LOW | MEDium | HIGH`

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5 Remote Control – Basics

This chapter gives a survey of the basic features and concepts of IS 136-MS remote control commands. Remote control can be described in terms analogous to the ones used in chapter 3 for the classification of measurement and configuration menus. In the following, we will particularly point out the similarities and differences between manual and remote control.

Structure of the IS 136-MS Function Groups

Chapter 6 of this manual lists gives a description of all IS 136-MS remote control commands, including their parameters, as well as the default values and ranges of all numerical parameters.

Function groups and test modes

The commands for the two function groups *IS 136 800-MS* and *IS 136 1900-MS* are largely identical, however, the ranges of numerical values and some default settings may not coincide. In such cases, the numerical values are explicitly quoted for both function groups.

Commands for the two test modes *Signalling* and *Non Signalling* are also listed separately although many of them have the same syntax. The commands for the measurement groups `POWer[:NBURst]`, `MODulation` and `SPECtrum` are identical in both test modes, so they are reported only once.

Addressing

The CMU uses extended addressing: The instrument is assigned a primary address while each function group and test mode is identified via a secondary address. This allows the same remote commands to be used in several function groups and modes:

```
ibwrt(h_IS800MS_SIG, "INITiate:POWer")
ibwrt(h_IS1900MS_SIG, "INITiate:POWer")
ibwrt(h_IS800MS_NSIG, "INITiate:POWer")
```

provided that the variables `h_IS800MS_SIG, etc.` have been appropriately defined, see program examples in chapter 7 of the CMU200 operating manual.

The remote control commands for first (`SYST:COMM:GPIB:ADDR`) and secondary (`SYST:REM:ADDR:SEC`) addressing are described in the CMU200 operating manual.

Order of commands

The commands are arranged to form groups belonging to the same measurement or to the same type of configurations. These command groups are identified by the second-level keyword (as in `POWer`). Applications belonging to a measurement group (see chapter 5 of the CMU200 operating manual) are identified by the third-level keyword of each command (as in `MODulation:EVMagnitude`). Chapter 6 is organized as follows:

IS 136-MS Non Signalling:

General configurations (second-level keywords `LEVEL`, `TRIGger`, `RFANalyzer`, `RFGENerator`, `INPut`, `OUTPut`, `CORRection:LOSS`, `DM:CLOCk`)

Measurement groups: `RXQuality`

Measurement groups (identical in Signalling and Non Signalling mode):

`POWer[:NBURst]`, `MODulation[:OVERview]`, `MODulation:EVMagnitude`, `MODulation:PERRor`, `MODulation:MERRor`, `SPECtrum[:ACPower]`

IS 136-MS Signalling:

General configurations and signalling (`LEVel, TRIGger, SIGNalling, HANDover, BSSignal, NETWork, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`).

Measurement groups (`POWer[:SBURst], MSSinfo, WPOWer, RXQuality`).

The structure of chapter 6 differs from chapter 4 *(Functions and their Application)* where the measurements are presented first and configurations pertaining to the whole function group and test mode are reported at the end of each section.

The menu of the graphical user interface corresponding to a group of commands is quoted at the beginning of each section. Alphabetical lists of all commands are annexed to chapter 6.

SCPI Conformity

In view of the particular requirements of IS 136-MS measurements not all commands could be taken from the SCPI standard. However, the syntax and structure of all commands is based on SCPI rules. For a detailed description of the SCPI standard refer to chapter 5 of the CMU200 operating manual.

SCPI confirmed and SPCI approved commands are explicitly marked throughout chapter 6.

Remote Control

All commands may be used for control of the CMU via GPIB interface or serial (RS-232) interface.

Measurement Control

The commands in the measurement groups quoted above (`WPOWer, POWer..., MODulation..., SPECtrum... etc.`) have an analogous structure and syntax. The measurements are controlled according to the common concepts outlined in Chapter 5 of the CMU200 operating manual. The following sections show how the general concepts are applied to IS 136-MS measurements.

Measurement Groups

The measurement groups are referred to as *measurement objects* (keyword <meas_obj>) in remote control. For IS 136-MS measurements, the following measurement objects are defined:

Table 5-1 Measurement objects in the *Signalling* and *Non Signalling* mode

IS 136-MS Non Signalling	**IS 136-MS Signalling**
–	`WPOWer` Wide-band peak power measurement of the input signal.
`POWer` Normal burst power as a function of time including statistical evaluations and the results of the limit check.	`POWer` Normal or shortened burst power as a function of time including statistical evaluations and the results of the limit check.

IS 136-MS Non Signalling	IS 136-MS Signalling
`MODulation...` Phase error (`MODulation:PERRor`), magnitude error (`MODulation:MERRor`) and error vector magnitude (`MODulation:EVMagnitude`) of the transmitted burst as a function of time plus scalar modulation quantities (`MODulation[:OVERview]`).	**`MODulation...`** Phase error (`MODulation:PERRor`), magnitude error (`MODulation:MERRor`) and error vector magnitude (`MODulation:EVMagnitude`) of the transmitted burst as a function of time plus scalar modulation quantities (`MODulation[:OVERview]`).
`SPECtrum[:ACPower]` Off-carrier power due to the modulation and the bursty nature of the RF signal including limit check in frequency-domain and time-domain (`SPECtrum[:ACPower]:TIME`) representation.	**`SPECtrum[:ACPower]`** Off-carrier power due to the modulation and the bursty nature of the RF signal including limit check in frequency-domain and time-domain (`SPECtrum[:ACPower]:TIME`) representation.
`RXQuality` Single shot bit error rate test including limit check.	**`RXQuality`** Bit error rate measurement and readout of the RSSI and the MAHO report transmitted by the mobile phone.

The measurement objects in Table 5-1 are complemented by groups of commands used to retrieve results that are automatically provided by the mobile station (e.g. the receiver parameters reported by the mobile phone). These command groups do not represent real measurement objects; they consist of queries only and are called pseudo measurement objects. For an overview, see the list of remote control commands at the end of chapter 6.

Measurement Statistics

In the digital IS 136 networks, the (modulated) RF signal is divided into periodic TDMA timeslots serving as basic evaluation periods for the measurement and for the calculation of statistical results.

Together with the *Statistic Count*, the *Repetition Mode* defines how many evaluation periods are measured if the measurement is not stopped explicitly (measurement control commands `STOP...`, `ABORT...`) or by a limit failure. With remote control the three repetition modes *Single Shot, Continuous* and *Counting* are available (*Counting* is not available in manual control, see chapter 3).

In `POWer`, `MODulation`, and `SPECtrum` measurements, different traces corresponding to the result in the current evaluation period, the maximum, minimum, extreme value, or average over a set of evaluation periods (bursts) are determined. These results can be queried independently.

Table 5-2 Repetition mode in remote control

Setting	Description	Command
Statistic Count	Integer number of evaluation periods forming one statistics cycle. An evaluation period is equal to a TDMA timeslot/burst (`POWer | MODulation | SPECtrum`) or a full TDMA frame (`RXQuality`). The statistic count is set together with the measured quantity.	`CONFigure:<meas_obj>:CONTrol SCALar | ARRay,` **`1 ... 1000 | NONE`** `(<meas_obj> = POWer... | WPOWer | MODulation... | SPECtrum...)` `CONFigure:RXQuality:BER:CONTrol:TSETup1:FRAMes` **`1 ... 500 | NONE`**

Status Reporting System

A general description of SCPI status registers and of the status reporting system is given in chapter 5 of the CMU200 operating manual. This section is devoted to the particular features concerning IS 136-MS measurements.

The CMU offers 30 independent `STATus:OPERation:CMU:SUM1|2:CMU<nr>` sub-registers (<nr>=1 ... 15) which are implemented in hierarchical form. The bits of the 30 `STATus:OPERation` registers are set only after the registers are assigned to a function group and measurement mode.

In the CONDition part, the `STATus:OPERation` register contains information on which actions the instrument is being executing or, in the EVENt part, information on which actions the instrument has executed since the last readout. All fife parts of the registers can be read using one of the commands of the subsystem `STATus:OPERation:SUM1|2:CMU<nr>:...`

IS 136-MS mobile tests comprise the two signalling modes *Non Signalling* and *Signalling* for each of the two function groups *IS 136 800/1900-MS* so that a total of 4 secondary addresses is used. In the two status registers for the *Non Signalling* mode the bit assignment is as follows:

Table 5-4 Meaning of the bits used in the **`STATus:OPERation:CMU:SUM1|2:CMU<nr>`** sub-registers assigned to *IS 136 800/1900-MS Non Signalling*

Bit-No.	**Meaning**	**Symbol in `STAT:OPER:SYMB...`**
6	**Reference Frequency not synchronized** This bit is set if the reference frequency is not synchronized.	RFNS

In the two status registers for the *Signalling* mode the bit assignment is as follows:

Table 5-5 Meaning of the bits used in the **`STATus:OPERation:CMU:SUM1|2:CMU<nr>`** sub-registers assigned to *IS 136 800/1900-MS Signalling*

Bit-No.	**Meaning**	**Symbol in `STAT:OPER:SYMB...`**
0	**Call from Mobile** This bit is set when the CMU receives a call from the mobile under test.	CFM
1	**Release from Mobile** This bit is set when the connection to the mobile is being released.	RFM
2	**Loss of Radio Link** This bit is set if the CMU had to leave the signalling state "Call Established" (because of a low signal etc.).	LORL
3	**Mobile Registered** This bit is set when a registration was successfully performed.	MREG
6	**Reference Frequency not synchronized** This bit is set if the reference frequency is not synchronized.	RFNS
7	**Mobile Deregistered** This bit is set if the CMU had to leave the signalling state "Registered" (because of a low signal etc.).	MDER
9	**Traffic Channel Active** This bit is set when voice data is transmitted via the analog voice channel.	TCH

Bit-No.	Meaning	Symbol in `STAT:OPER:SYMB...`
10	**MAHO Report** This bit when the CMU receives a MAHO report from the mobile under test.	MREP
11	**RF Input overdriven** This bit is set if one of the three RF input connectors is overdriven.	RFIO
12	**RF Input underdriven** This bit is set if one of the three RF input connectors is underdriven.	RFIU

Special Terms and Notation

Below we list some particular features in the syntax of the IS 136-MS commands. The general description of the SCPI command syntax can be found in chapter 5 of the CMU200 operating manual, section *"Structure and Syntax of Device Messages"*.

Description of commands

The commands are arranged in tables. From top to bottom, the table rows contain the following entries:

1. Complete command syntax including the parameter list and a short description of the command
2. List and description of the parameters with their default values, the units and unit rings
3. Detailed description of the command, signalling state required for command execution (in *Signalling* mode), required firmware version

Detailed lists of default values are annexed to the command description. Occasionally, groups of analogous commands are described in common tables.

Order of commands

The commands are arranged according to their function specified by the keyword in the second level or in the second/third level combined. Lower-level keywords define the command in more detail. This means that commands with the same second-level, third-level etc. keywords are generally grouped together in the same sections.

Example: `CONFigure:WPOWer:CONTrol:REPetition`

Commands with the keyword *`WPOWer`* in the second level belong to the wide-band power measurement. The keywords in the third and fourth level indicate that the command controls the repetition mode of the power measurement.

Measurement object

The term *measurement object* denotes a group of remote control commands belonging to the same group of measured quantities. E.g., all commands concerning the wide-band power measurement form a common measurement object.

A pseudo measurement object concerns quantities which do not actually have to be measured because they are automatically obtained during the signalling process (e.g. the receiver parameters reported by the mobile phone).

Combined measurements

To limit the number of remote control commands, scalar results are always measured together and output in lists. Arrays (e.g. the traces for `POWer` and `MODulation` measurements) are output as lists of values separated by commas; it is possible to retrieve either the whole list (see commands `READ:ARRay...` etc.) or the values located in a number of subranges that are part of the total measurement range (see commands `READ:SUBarrays...;` the subarrays are defined via `CONFigure:SUBarrays...`).

Parameters Setting commands are usually supplemented by a parameter or a list of several parameters. Parameters either provide alternative options (setting a or setting b or setting c ..., see special character "|"), or they form a list separated by commas (setting x,y).

<Par_Name> In the command tables and lists, parameters are generally described by a name (literal) written in angle brackets (<>). This literal merely serves as a parameters description; in an application program it must be replaced by one of the possible settings reported in the detailed parameter description.

Example: `CONFigure:POWer:CONTrol <Mode>,<Statistics>`

with
```
<Mode>       = SCALar | ARRay
<Statistics> = 1 ... 10000 | NONE
```

possible command syntax: `CONF:POW:CONT SCAL,NONE`

NAN NAN (not a number) is generally used to represent missing data, e.g. if a portion of a trace has not been acquired yet. It is also returned after invalid mathematical operations such as division by zero. As defined in the SCPI standard, NAN is represented as 9.91 E 37.

INV INV (invalid) is returned if a limit check is performed without defining the appropriate tolerance values.

Upper / lower case Upper/lower case characters characterize the long and short form of the keywords in a command. The short form consists of all upper-case characters, the long form of all upper case plus all lower case characters. On the CMU, either the short form or the long form are allowed; mixed forms will generally not be recognized. Note that the instrument itself does not distinguish upper case and lower case characters.

Special characters

| A vertical stroke in the parameter list characterizes alternative parameter settings. Only one of the parameters separated by | must be selected.

Example: The following command has two alternative settings:

`TRIGger:SEQuence:DEFault ON | OFF`

[ ] *Key words* in square brackets can be omitted when composing the command header (see chapter 5 of the CMU manual, section "Structure of a Command"). The complete command must be recognized by the instrument for reasons of compatibility with the SCPI standard.

Parameters in square brackets are optional as well. They may be entered in the command or omitted.

{ } Braces or curly brackets enclose one or more parameters that may be included zero or more times.

<nr> This symbol denotes a numeric suffix, e.g. an enumeration index for input and output connectors.

Lists of commands

Command:	The *Command* column of the table contains all remote control commands arranged according to their function (configurations or measurement objects). Within a section, the commands are listed in alphabetical order.
Parameters:	The *Parameter* column lists the parameters of the commands.
Remarks:	The *Remarks* column gives additional information about the commands which – Have no query form *(no query)* – Have only a query form *(query only)* – Can be used both as setting commands and as queries (*with query*, this applies to all commands belonging to none of the two preceding categories)
Alphabetical Lists	Chapter 6 concludes with alphabetical command lists for both test modes.

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6 Remote Control – Commands

In the following, all remote-control commands for the function groups *IS 136 800/1900-MS* will be presented in tabular form with their parameters and the ranges of values. The structure of this chapter is analogous to that of the reference part for manual operation (chapter 4).

- The measurement modes *Non Signalling* and *Signalling* are presented separately.
- Within the measurement modes, first the general configuration and then the individual measurement groups (test objects) are dealt with.
- Measurement groups that are identical in both test modes `(POWer[:NBURst], MODulation..., SPECtrum...)` are presented in a separate section between the two test modes.

General notes on remote control in the function group *IS 136 800/1900-MS* can be found in Chapter 5. An introduction to remote control according to SCPI standard and the status registers of the CMU is given in chapter 5 of the operating manual for the CMU basic instrument.

TDMA Module Tests (Non Signalling)

In the *Non Signalling* mode, an RF test signal can be generated and an RF signal with IS-136 characteristics is analyzed. No signalling parameters are transferred.

Group Configuration

The remote-control commands in this section are used to configure the measurements in the function group *IS 136 800/1900-MS Non Signalling* globally, i.e., they provide settings that are valid for all measurements within the function group. They correspond to the settings in the popup menu of the softkey *Group Config.* located to the left of the headline of each main menu.

Subsystem LEVel (Input Level)

The subsystem *LEVel* determines the input level for the currently used input. It corresponds to the tab *Input Level* in the popup menu *Group Configuration*.

[SENSe:]LEVel:MODE <*Mode*>				Input level – Mode
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
MANual	Manual setting	MANual	–	
Description of command				FW vers.
This command defines the mode for setting the maximum input level.				1.00

[SENSe:]LEVel:MAXimum *<Level>*				Max. Level
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0 dBm to +53 dBm	Maximum input level for RF 1	+30.0	dBm	
–14 dBm to 39 dBm	Maximum input level for RF 2	+30.0	dBm	
–37 dBm to 0 dBm	Maximum input level for RF 4 IN	0.0	dBm	
Description of command				FW vers.
This command defines the maximum expected input level. The value range depends on the RF input used and the external attenuation set (see `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]` command).				1.00

[SENSe:]LEVel:ATTenuation *<Mode>*				Attenuation
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NORMal |	Mixer level in normal range	NORMal	–	
LNOise |	Low noise (mixer level 10 dB higher than in normal setting)			
LDIStortion	Low distortion (mixer level 10 dB lower than in normal setting)			
Description of command				FW vers.
This command tunes the RF analyzer for normal setting, low noise level (full dynamic range), or low distortion (high intermodulation spacing).				1.00

[SENSe:]LEVel:DEFault				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				1.00

Subsystem TRIGger (Trigger Mode)

The subsystem *TRIGger* determines the trigger mode. It corresponds to the tab *Trigger* in the popup menu *Group Configuration*.

TRIGger[:SEQuence]:SOURce *<Source>*				Source
<Source>	Description of parameters	Def. value	Def. unit	Unit ring
FRUN |	Trigger by TDMA burst detected by instrument software	FRUN	–	
RFPower |	Wide-band power trigger			
IFPower |	Narrow-band trigger			
EXTern	External trigger signal via AUX3			
Description of command				FW vers.
This command determines the trigger condition. The settings *RFPower* and *IFPower* assume bursted signals.				*1.00*

TRIGger[:SEQuence]:THReshold *<Threshold>* Level

<Threshold>	Parameter description	Def. value	Default unit	Unit ring
LOW | **MEDium |** **HIGH**	Low trigger threshold (reference level - 26 dB) Medium trigger threshold (reference level - 16 dB) High trigger threshold (Reference level - 6 dB))	MED	–	

Command description	FW vers.
This command sets the the signal level at which the measurement is triggered (see `TRIG:SEQ:SOUR`). The command is enabled for trigger source `RFPower` and `IFPower` only.	1.005

TRIGger[:SEQuence]:DEFault Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	1.00

Connection Control

The remote-control commands presented in this section determine the RF analyzer settings and the signals generated by the CMU, the inputs and outputs used as well as the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect. Control*, located to the right of the headline of each main menu.

Subsystem RFANalyzer (Analyzed Input Signals)

The subsystem *RFANalyzer* configures the RF analyzer, i.e., it specifies which type of RF signals can be analyzed. It corresponds to the panel *Analyzer Settings* in the tab *Signal* in the popup menu *Connect. Control*.

[SENSe:]RFANalyzer:FREQuency <*Number*> RF Channel

<Number>	Description of parameters	Def. value	Def. unit	Unit ring
200,000 Hz to 2,700,000,000 Hz (see also data sheet)	Input frequency (in multiples of 10 kHz)	824,010,000 (IS-136 800) 1850,040,000 (IS-136 1900)	Hz Hz	

Description of command	FW vers.
This command defines the frequency of the RF signal analyzed. With the command `[SENSe:]RFANalyzer:FREQuency:UNIT`, the default frequency unit can be changed, and even IS 136 channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the reverse channel (signal direction from mobile to CMU).	1.00

[SENSe:]RFANalyzer:FREQuency:UNIT <*Unit*> Frequency Unit

<Unit>	Description of parameters	Def. value	Def. unit	Unit ring
Hz | KHZ | MHZ | GHZ | CH	Frequency unit | Channel number	Hz	Hz	

Description of command	FW vers.
This command defines whether the frequency of the RF signal analyzed is specified in frequency units or as an IS 136 channel number. Frequency units must be used to select input signals that are outside the designated channel range.	1.00

[SENSe:]RFANalyzer:FREQuency:OFFSet <*FreqOffset*> Frequency Offset

<FreqOffset>	Description of parameters	Def. value	Def. unit	Unit ring
–15000 Hz to +15000 Hz	Offset for channel frequency	0	Hz	

Description of command	FW vers.
This command defines an offset for the RF analyzer frequency set with the command `[SENSe:]RFANalyzer:FREQuency <Number>`. The offset frequency must be in multiples of 1 Hz.	1.00

[SENSe:]RFANalyzer:EMSSync <*SyncPattern*>				Expected MS Sync.
<SyncPattern>	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **IS1 to IS6 |** **ALL**	No detection of sync. pattern Standard IS-136 sync. patterns All sync. patterns allowed	OFF	–	
Description of command				FW vers.
This command sets a condition for the synchronization pattern of the analyzed signal. If no sync. pattern is specified *(OFF)*, all signals are measured. With the parameter *ALL*, the RF input signal is checked for an arbitrary sync. pattern.				1.00

Generator Object "RFGenerator" – Generator control

The subsystem *RFGenerator* configures the RF signals generated by the CMU. It corresponds to the softkey *RF Generator* in the tab *Signal* in the popup menu *Connect. Control* and the measurement menu *Analyzer/Generator*.

INITiate:RFGenerator **ABORt:RFGenerator**	Start RF generator, reserve resources Switch off RF generator, release resources	*RUN* *OFF*
Description of command		FW vers.
These commands have no query form. They start and stop the RF generator, setting it to the status indicated in the top right column.		1.00

FETCh:RFGenerator:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **ERR**	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	
Description of command				FW vers.
This command is always a query. It returns the current generator status.				1.00

Generator Level – Subsystem RFGenerator:LEVel

The subsystem *RFGenerator:LEVel* determines the level of the generated RF signal. It corresponds to the input field *RF Level* of the panel *RF Generator* in the tab *Signal* in the popup menu *Connect. Control.*

SOURce:RFGenerator:LEVel <*Level*>				RF Level
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–137 dBm to –27 dBm **–137 dBm to –10 dBm** **–90 dBm to +13 dBm**	Output level at RF 1 Output level at RF 2 Output level at RF 3 OUT	–50 –50 –50	dBm dBm dBm	
Description of command				FW vers.
This command determines the RF generator level. The value range depends on the used RF output of the CMU and the external attenuation set (see `[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]` command).				1.00

RF Generator Frequency – Subsystem RFGenerator:FREQuency

The subsystem *RFGenerator:FREQuency* determines the frequency of the generated RF signals. It corresponds to the softkeys *RF Channel* and *Frequency Offset* of the panel *RF Generator* in the tab *Signal* in the popup menu *Connect. Control.*

SOURce:RFGenerator:FREQuency *<Number>* RF Channel

<Number>	Description of parameters	Def. value	Def. unit	Unit ring
20,000 Hz to 2,700,000,000 Hz (see also data sheet)	Input frequency (in multiples of 10 kHz)	869,010,000 (IS 136 800) 1845,000,000 (IS 136 1900)	Hz Hz	

Description of command	FW vers.
This command defines the frequency of the RF signal generated. With the command `SOURce:RFGenerator:FREQuency:UNIT`, the default frequency unit can be changed, and even IS 136 channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the forward channel (signal direction from CMU to mobile under test).	1.00

SOURce:RFGenerator:FREQuency:UNIT *<Unit>* Frequency Unit

<Unit>	Description of parameters	Def. value	Def. unit	Unit ring
Hz | KHZ | MHZ | GHZ | CH	Frequency unit | Channel number	Hz	Hz	

Description of command	FW vers.
This command defines whether the frequency of the RF signal generated is specified in frequency units or as an IS 136 channel number. Frequency units must be used to select input signals that are outside the designated IS 136 channel range.	1.00

SOURce:RFGenerator:FREQuency:OFFSet *<FrequencyOffset>* Frequency Offset

<FrequencyOffset>>	Description of parameters	Def. value	Def. unit	Unit ring
–15,000 Hz to +15,000 Hz	Frequency offset	0	Hz	

Description of command	FW vers.
This command defines an offset for the RF generator frequency set with the command `[SENSe:]RFGenerator:FREQuency <Number>`. The offset frequency must be in multiples of 1 Hz.	1.00

Subsystem RFGenerator:MODulation

The subsystem *RFGenerator:MODulation* determines an bit sequence which is modulated on the RF signal. It corresponds to the softkey *RF Signal Type* in the tab *Signal* in the popup menu *Connect. Control.*

CONFigure:RFGenerator:MODulation:RFS:TYPE <*Selection*>				RF Signal Type
<Selection>	Description of parameters	Def. value	Def. unit	Unit ring
BER |	BER test signal	BER	–	
CW |	Empty carrier (continuous wave)			
PRBS	Pseudo-random bit sequence			
Description of command				FW vers.
The command selects a bit sequence used to modulate the generated RF signal.				1.00

Subsystem for Input and Output (External Attenuation at the Connectors)

The subsystem for input and output configures the input and output connectors. The subsystem corresponds to the tab *RF* ⊙ in the popup menu *Connect. Control.*

INPut[:STATe] <*State*>				RF Input
<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 |	Connector RF 1 used as input	RF2	–	
RF2 |	Connector RF 2 used as input			
RF4	Connector RF 4 IN used as input			
Description of command				FW vers.
This command determines the connector to be used for RF input signals. The bidirectional connectors RF 1 and RF 2 can be used both as input and output connectors in the same measurement (see `OUTPut[:STATe]`). Only one input and one output may be active at the same time, a new RF input setting supersedes the previous one.				1.00

OUTPut[:STATe] <*State*>				RF Output
<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 |	Connector RF 1 used as output	RF2	–	
RF2 |	Connector RF 2 used as output			
RF3	Connector RF 3 OUT used as output			
Description of command				FW vers.
This command determines the connector to be used for RF output signals. The bidirectional connectors RF 1 and RF 2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`). Only one input and one output may be active at the same time, a new RF output setting supersedes the previous one.				1.00

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] *<Attenuation>*
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] *<Attenuation>* Ext. Att. Input

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB	Value for external attenuation at the input <nr>, where <nr> = 1,2,4	0.0	dB	

Description of command	FW vers.
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.	1.00

[SENSe:]CORRection:LOSS:Output<nr>[:MAGNitude] *<Attenuation>*
SOURce:CORRection:LOSS:Output<nr>[:MAGNitude] *<Attenuation>* Ext. Att. Output

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB	Value for external attenuation at output <nr>, where <nr> = 1,2,3	0.0	dB	

Description of command	FW vers.
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.	1.00

Subsystem DM:CLOCk (Synchronization)

The subsystem *DM:CLOCk* sets a system clock specific to the network. This frequency is set in the tab *Synch.* in the popup menu *Connect. Control.*

SOURce:DM:CLOCk:STATe *<Mode>* REF OUT 2 on/off

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on/off system clock	OFF	–	

Description of command	FW vers.
This commands switches the system clock specific to the network at the *REF OUT 2* connector on or off.	1.00

SOURce:DM:CLOCk:FREQuency <Frequency> REF OUT 2

<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
9.72 MHz to 38.88 MHz	System clock frequency	12.96	MHz	

Description of command	FW vers.
This command determines the system clock frequency applied to *REF OUT 2*. The frequency entered is internally rounded to one of the following discrete values: 38.88 MHz, 19.44 MHz, 12.96 MHz, 9.72 MHz	1.00

Common Measurement Groups

The commands for the measurement groups in this section are identical in both test modes; they can be used in *Non Signalling* as well as in *Signalling* measurements.

Test Object POWer[:NBURst]

The subsystem *POWer* measures the MS output carrier power versus time. The subsystem corresponds to the measurement menu *Power* and the associated popup menu *Power Configuration.*

The optional keyword `[:NBURst]` denotes normal burst measurements that are available in both test modes. A second application (shortened bursts, `SBURst`) is available in *Signalling* mode only; the corresponding commands are reported in section *IS-136 Mobile Tests (Signalling Mode)*.

Control of measurement – Subsystem Power

The subsystem *POWer* controls the power measurement.

INITiate:POWer[:NBURst][:DQPSk]	Start new measurement	*RUN*
ABORt:POWer[:NBURst][:DQPSk]	Abort running measurement and switch off	*OFF*
STOP:POWer[:NBURst][:DQPSk]	Stop measurement after current stat. cycle	*STOP*
CONTinue:POWer[:NBURst][:DQPSk]	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.		1.00

CONFigure:POWer[:NBURst][:DQPSk]:EREPorting <*Mode*>				Event Reporting
<*Mode*>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting*, see chapter 5 of CMU200 manual).				1.00

FETCh:POWer[:NBURst][:DQPSk]:STATus?		Measurement Status		
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).				1.00

Subsystem POWer:CONTrol

The subsystem *POWer:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Power Configuration.*

CONFigure:POWer[:NBURst][:DQPSk]:CONTrol *<Mode>, <Statistics>*		Scope of Measurement		
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | **ARRay**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | **NONE**	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				≥1.15

CONFigure:POWer[:NBURst][:DQPSk]:CONTrol:REPetition
<Repetition>,<StopCond>,<Stepmode>

Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)	SING	–	
SINGleshot |	Single shot measurement (until `Status = RDY`)			
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)			

<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror |	Stop measurement in case of error *(stop on error)*	NONE	–	
NONE	Continue measurement even in case of error			

<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE	Continue measurement according to its rep. mode			

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	1.00

DISPlay:POWer[:NBURst][:DQPSk]:CONTrol:GRID *<Enable>*

Grid on/off

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	Switch on the grid lines	ON	–	
OFF	Switch off the grid lines			

Description of command	FW vers.
This command switches the grid lines in the test diagram on or off.	1.00

CONFigure:POWer[:NBURst][:DQPSk]:CONTrol:DEFault

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	The parameters differ from the default values (partially or totally)			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	1.00

Test Configuration

The commands of the following subsystems determine the parameters of the signal power measurement. They correspond to the *Power Configuration* popup menu. For a detailed explanation of the power tolerance template defined in the GSM standard see chapter 4.

Subsystem POWer:LIMIt:LINE

The subsystem *POWer:LIMit:LINE* defines the limit lines, i.e. the tolerance values for the power measurement. The subsystem corresponds to the tab *Limit Lines* in the popup menu *Power Configuration.*

CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]
:UPPer:AREA<nr>:ENABle *<Enable>*
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]
:UPPer:AREA<nr> *<LevelRel>, <EnableArea>* Upper Limit Line

Parameters	Value range	Description of parameters	Def. unit
<Enable>	ON | OFF	Area on/off	See below
<LevelRel>, ***<EnableArea>***	–100 dB to +10 dB, ON | OFF	Relative level Range of limit lines on/off	

Description of command	FW vers.
These commands activate and define upper limit lines for normal bursts. The limit lines are defined area by area; the suffix <nr> numbers the five areas in the burst diagram (see chapter 4). The `:ENABle` command is suitable for reactivating a limit line area that was previously defined and disabled.	1.00

The default settings are given in the table below:

Suffix	EnableArea	LevelRel
1	ON	–60 dB
2	OFF	+6 dB
3	ON	+4 dB
4	OFF	+6 dB
5	ON	–60 dB

The setting *EnableArea* = *Off* implies that the corresponding range, including the limit check, is switched off. *Enable* = *Off* switches off the entire limit check.

CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer:ENABle *<Enable>*
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer
<LevelRel>, <EnableArea> Upper Limit Line

Parameters	Value range	Description of parameters	Def. unit
<Enable>	ON | OFF	Area on/off	
<LevelRel>, ***<EnableArea>***	–100 dB to 10 dB, ON | OFF	Relative level Range of limit lines on/off	

Description of command	FW vers.
These commands activate and define the lower limit line for normal bursts. The default relative level is *LevelRel = –20 dB*. The setting *EnableArea* = *Off* implies that the corresponding range, including the limit check, is switched off. *Enable* = *Off* switches off the entire limit check.	1.00

CONFigure:POWer[:NBURst][:DQPSk]:LIMit:POINt[:ASYMmetrical]:LPOWer *<Limit>* Leakage Power Limit

<Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dBm to 0 dBm	Upper limit of leakage power	–60	dBm	

Description of command	FW vers.
This commands defines the upper limit for the leakage power.	1.00

CONFigure:POWer[:NBURst][:DQPSk]:LIMit:DEFault Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	the parameters are set to their default values	ON	–	
OFF	The parameters differ from the default values (partially or totally)			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	1.00

Subsystem POWer:TIME

The subsystem *POWer:...TIME* contains the command for shifting the burst relative to the time axis (and thus the tolerance template). The subsystem corresponds to the popup window *Time - Mode* in the graphical measurement menu *Power*.

CONFigure:POWer[:NBURst][:DQPSk]:TIME:OVERsampling *<Factor>* Mode

<Factor>	Description of parameters	Def. value	Def. unit	Unit ring
1 | 8	Oversampling factor; no. of samples per symbol	8	–	

Description of command	FW vers.
This command defines how many samples are taken and displayed per symbol.	1.00

Subsystem SUBarrays:POWer

The subsystem *SUBarrays:POWer* defines the measurement range and the type of output values.

CONFigure:SUBarrays:POWer[:NBURst][:DQPSk] **<Mode>,<Start>,<Samples>{,<Start>,<Samples>}**				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | **ARIThmetical |** **MINimum |** **MAXimum,**	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
–20 Symbols to 181 Symbols,	Start time in current range	–20	Symb.	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 202 | **0 to 1616**	No. of samples in range, oversamp. 1 No. of samples in range, oversamp. 8	202 1616	– –	
Description of command				FW vers.
This command configures the `READ:SUBarrays:POWer...`, `FETCh:SUBarrays:POWer...`, and `SAMPle:SUBarrays:POWer` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by a start time and the number of test points which are located on a fixed, equidistant grid. The spacing between the test points is given by the oversampling factor set via `CONFigure:POWer[:NBURst][:DQPSk]:TIME:OVERsampling 1 | 8`. The subranges may overlap but must be within the total range of the *POWer* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.				1.00

Measured Values – Subsystem POWer[:RESult]

The subsystem *POWer[:RESULT]* determines and outputs the results of the signal power measurement. They correspond to the graphical measurement menu *Power* with its various display elements.

READ[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]? Scalar results:
Start single shot measurement and return results

FETCh[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?
Read out measurement results (unsynchronized)

SAMPle[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
BurstsOutOfTol,	0.0 % to 100.0 %	NAN	%	
BurstPwCurrPeak,	–100.0 dBm to +20.0 dBm	NAN	dBm	
BurstPwCurrRMS,	–100.0 dBm to +20.0 dBm	NAN	dBm	
LeakPowPeak,	–100.0 dBm to +20.0 dBm	NAN	dBm	
LeakPowRMS,	–100.0 dBm to +20.0 dBm	NAN	dBm	
BurstMatchCurr,	MATC | NMAT | INV | OUT	INV	–	
BurstMatchMin,	MATC | NMAT | INV | OUT	INV	–	
BurstMatchMax,	MATC | NMAT | INV | OUT	INV	–	
BurstMatchAvg	MATC | NMAT | INV | OUT	INV	–	

Description of command — FW vers. 1.00

These commands are always queries. They start a measurement and output all scalar measurement results (see chapter 5). These are:

Peak power of current burst
Average power of current burst
Peak leakage power
Average leakage power
Matching of current burst power, average, minimum, and maximum burst power

The calculation of results in an *average* or *peak* measurement is described in chapter 3 (see *display modes*).The following messages may be output for the value *BurstMatch...*:

MATC	*matching*
NMAT	*not matching*
INV	*invalid*
OUT	*out of range*

CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:CURRent[:RESult]:MATChing? Limit Matching
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:AVERage[:RESult]:MATChing?
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:MINimum[:RESult]:MATChing?
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]:MATChing?

Returned values	Value range	Def. value	Def. unit	Unit ring
BurstPwCurrRMS,	NMAU | NMAL | INV | OK	INV	–	
LeakPowRMS,	NMAU | NMAL | INV | OK	INV	–	
BurstMatching	MATC | NMAT | INV | OUT	INV	–	

Description of command — FW vers. 1.00

This command is always a query. It indicates whether and in which way the tolerances for the effective burst and leakage power (see command above) have been exceeded (the *BurstMatching* parameter combines the two preceding values).

The following messages may be output for the values *LeakPowRMS and BurstPwCurrRMS:*

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CALCulate[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]:MATChing:RAMP? Limit Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
BurstMatchCurr,	For all values:	INV	–	
BurstMatchMin,		INV	–	
BurstMatchMax,	MATC | NMAT | INV | OUT	INV	–	
BurstMatchAvg		INV	–	

Description of command — FW vers. 1.00

This command is always a query. It indicates whether and in which way the tolerances for the scalar measured values (see command above) have been exceeded.

The following messages may be output for the value *BurstMatching*:

MATC	*matching*
NMAT	*not matching*
INV	*invalid*
OUT	*out of range*

READ:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]? Burst Power
READ:ARRay:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?
READ:ARRay:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?
READ:ARRay:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?
Start single shot measurement and return results *RUN*
FETCh:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?
FETCh:ARRay:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?
FETCh:ARRay:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?
FETCh:ARRay:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?
Read meas. results (unsynchronized) *RUN*
SAMPle:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?
SAMPle:ARRay:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?
SAMPle:ARRay:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?
SAMPle:ARRay:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?
Read results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 dB... + 20.0 dB,	BurstPower[1], 1st value for burst power	NAN	dB	
...	...	...	...	
–100.0 dB... + 20.0 dB	BurstPower[x], xth value for burst power	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the burst power versus time at fixed, equidistant test points. The number of measured values is 202 (oversampling factor 1) or 1616 (oversampling factor 8; see command `CONFigure:POWer[:NBURst][:DQPSk]:TIME:OVERsampling` *<Factor>*). The calculation of results in the modes *current, average, maximum* and *minimum* is explained in chapter 3 (see *display modes*).	1.00

READ:SUBarrays:POWer[:NBURst][:DQPSk]:CURRent[:RESult]? Subarray Results
READ:SUBarrays:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?
READ:SUBarrays:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?
READ:SUBarrays:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?
Start single shot measurement and return results *RUN*
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?
Read meas. results (unsynchronized) *RUN*
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?
Read results (synchronized) *RUN*

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 dB... + 20.0 dB	BurstPower[1], 1st value for burst power	NAN	dB	
...	...	...	...	
–100.0 dB... + 20.0 dB	BurstPower[x], xth value for burst power	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the burst power versus time in the subranges defined by means of the `CONFigure:SUBarrays:POWer` command. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above. The `CONFigure:SUBarrays:POWer` command defines a maximum of 32 subranges. If one of the statistical modes (`ARIThmetical`, `MINimum`, `MAXimum`) is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in chapter 3 (see *display mode*).	1.00

CALCulate:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]:MATChing:
LIMit[:LINE][:ASYMmetrical][:COMBined]?
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:AVERage[:RESult]:MATChing:
LIMit[:LINE][:ASYMmetrical][:COMBined]?
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:MINimum[:RESult]:MATChing:
LIMit[:LINE][:ASYMmetrical][:COMBined]?
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]:MATChing:
LIMit[:LINE][:ASYMmetrical][:COMBined]?
Burst Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
32-bit field,	Indicator for upper limit matching in area 1 to 5	NAN	–	
32-bit field	Indicator for lower limit matching in area 1 to 5	NAN	–	

Description of command	FW vers.
This command is always a query. Any set bit of the two returned bit fields indicates that the corresponding section of the limit lines is violated.	1.00

Test Object MODulation[:OVERview]

The subsystem *MODulation[:OVERview]* measures general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation*, application *Overview*, and the associated popup menu *Modulation Error Config*.

Control of Measurement – Subsystem MODulation[:OVERview]

The subsystem *MODulation[:OVERview]* controls the modulation measurement. It corresponds to the softkey *Overview DQPSK* in the measurement menu *Modulation*.

INITiate:MODulation[:OVERview][:DQPSk]	Start new measurement	*RUN*
ABORt:MODulation[:OVERview][:DQPSk]	Abort running measurement and switch off	*OFF*
STOP:MODulation[:OVERview][:DQPSk]	Stop measurement after current stat. cycle	*STOP*
CONTinue:MODulation[:OVERview][:DQPSk]	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	1.00

CONFigure:MODulation[:OVERview][:DQPSk]:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting*, see chapter 5 of CMU200 manual).	1.00

FETCh:MODulation[:OVERview][:DQPSk]:STATus? Measurement Status

Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate, CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE,	No counting mode set	NONE	–	
1 to 1000 |	Counter for current evaluation period within a cycle			
NONE	Statistic count set to off	NONE	–	

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).	1.00

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Spectrum Configuration* menu that are related to the *Overview* application.

Subsystem MODulation[:OVERview][:DQPSk]:CONTrol

The subsystem *MODulation[:OVERview][:DQPSk]:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Error Config*.

CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol *<Mode>, <Statistics>*

Scope of Measurement

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar |	Only scalar measured values (incl. tolerance matching)	ARRay	–	
ARRay	Scalar measured values and arrays			
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 |	No. of bursts within a statistics cycle	100	–	
NONE	Statistics off			

Description of command	FW vers.
This command selects the type of measured values and determines the number of bursts forming one statistics cycle.	1.00

CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol:REPetition *<Repetition> ,<StopCond>,<Stepmode>*

Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)	SING	–	
SINGleshot |	Single shot measurement (until `Status = RDY`)			
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)			
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror |	Stop measurement in case of error *(stop on error)*	NONE	–	
NONE	Continue measurement even in case of error			
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE	Continue measurement according to its rep. mode			

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	1.00

CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol:DEFault *<Mode>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				1.00

Tolerance values – Subsystem MODulation:OEMP[:DQPSk]:LIMit

The subsystem *MODulation:OEMP[:DQPSk]:LIMit* defines tolerance values for the modulation measurement **in all four applications**. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit[:WBURst] ***<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>***				Limits Whole Burst
Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0.0 deg to +50.0 deg,	PhaseErrorPeak	+12.0	deg	
0.0 deg to +50.0 deg,	PhaseErrorRMS	+5.0	deg	
0.0 % to +50.0 %,	MagnErrorPeak	+35.0	%	
0.0 % to +50.0 %,	MagnErrorRMS	+12.5	%	
0.0 % to +50.0 %,	EVMErrorPeak	+35.0	%	
0.0 % to +50.0 %,	EVMErrorRMS	+12.5	%	
–333.3 dB to 333.3 dB,	OriginOffset	–20.0	dB	
–333.3 dB to 333.3 dB,	IQImbalance	–20.0	dB	
0 Hz to 1000 Hz	FrequencyError	+200	Hz	
Description of command				FW vers.
This command defines upper limits for the *Current* and *Max./Min.* traces evaluated over the whole burst and for the scalar modulation parameters derived from them.				1.00

CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit:FTSYmbols Limits 1st 10 Symbols
<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>

Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0.0 deg to +50.0 deg,	PhaseErrorPeak	+12.0	deg	
0.0 deg to +50.0 deg,	PhaseErrorRMS	+10.0	deg	
0.0 % to +50.0 %,	MagnErrorPeak	+35.0	%	
0.0 % to +50.0 %,	MagnErrorRMS	+25.0	%	
0.0 % to +50.0 %,	EVMErrorPeak	+35.0	%	
0.0 % to +50.0 %,	EVMErrorRMS	+25.0	%	
–333.3 dB to 333.3 dB,	OriginOffset	–20.0	dB	
–333.3 dB to 333.3 dB,	IQImbalance	–20.0	dB	
0 Hz to 1000 Hz	FrequencyError	+200	Hz	

Description of command	FW vers.
This command defines upper limits for the *Current* and *Max./Min.* traces evaluated over the first ten valid symbols of the burst and for the scalar modulation parameters derived from them.	1.00

CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit[:WBURst] Limits Whole Burst
<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>

Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0.0 deg to +50.0 deg,	PhaseErrorPeak	+12.0	deg	
0.0 deg to +50.0 deg,	PhaseErrorRMS	+5.0	deg	
0.0 % to +50.0 %,	MagnErrorPeak	+35.0	%	
0.0 % to +50.0 %,	MagnErrorRMS	+12.5	%	
0.0 % to +50.0 %,	EVMErrorPeak	+35.0	%	
0.0 % to +50.0 %,	EVMErrorRMS	+12.5	%	
–333.3 dB to 333.3 dB,	OriginOffset	–20.0	dB	
–333.3 dB to 333.3 dB,	IQImbalance	–20.0	dB	
0 Hz to 1000 Hz	FrequencyError	+200	Hz	

Description of command	FW vers.
This command defines upper limits for the *Average* trace evaluated over the whole burst and for the scalar modulation parameters derived from it.	1.00

CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit:FTSYmbols Limits 1st 10 Symbols
<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>

Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0.0 deg to +50.0 deg,	PhaseErrorPeak	+12.0	deg	
0.0 deg to +50.0 deg,	PhaseErrorRMS	+10.0	deg	
0.0 % to +50.0 %,	MagnErrorPeak	+35.0	%	
0.0 % to +50.0 %,	MagnErrorRMS	+25.0	%	
0.0 % to +50.0 %,	EVMErrorPeak	+35.0	%	
0.0 % to +50.0 %,	EVMErrorRMS	+25.0	%	
–333.3 dB to 333.3 dB,	OriginOffset	–20.0	dB	
–333.3 dB to 333.3 dB,	IQImbalance	–20.0	dB	
0 Hz to 1000 Hz	FrequencyError	+200	Hz	

Description of command	FW vers.
This command defines upper limits for the *Average* trace evaluated over the first ten valid symbols of the burst and for the scalar modulation parameters derived from it.	1.00

CONFigure:MODulation:OEMP[:DQPSk]:LIMit:DEFault *<Mode>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	1.00

Measured Values – Subsystem MODulation[:OVERview][:DQPSk][:RESult]

The subsystem *MODulation[:OVERview][:DQPSk][:RESULT]* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Overview*.

READ[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult][:WBURst]? Scalar Results:
READ[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:FTSYmbols?
Start single shot measurement and return results
FETCh[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult][:WBURst]?
FETCh[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:FTSYmbols?
Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult][:WBURst]?
SAMPle[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:FTSYmbols?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
PhErrorPeakCurr,	–100.0 deg to +100.0 deg	NAN	deg	
PhErrorPeakAvg,	–100.0 deg to +100.0 deg	NAN	deg	
PhErrorPeakMMax,	–100.0 deg to +100.0 deg	NAN	deg	
PhErrorRMS (x3),	–100.0 deg to +100.0 deg	NAN	deg	
MagnErrorPeak (x3),	0.0 % to 100.0 %	NAN	%	
MagnErrorRMS (x3),	0.0 % to 100.0 %	NAN	%	
EVMPeak (x3),	0.0 % to 100.0 %	NAN	%	
EVMRMS (x3),	0.0 % to 100.0 %	NAN	%	
OriginOffset (x3),	–100.0 dB to +100.0 dB	NAN	dB	
IQImbalance (x3),	–100.0 dB to +100.0 dB	NAN	dB	
FrequencyError (x3),	–1000.0 Hz to +1000.0 Hz	NAN	Hz	
MSSyncDetectedCurr,	IS1 to IS6 | NONE	NAN	–	
AmplitudeDroopCurr,	–100.0 dB to +100.0 dB	NAN	dB	
TimingErrorCurr,		NAN	Sym	
AvgBurstPowerCurr,	–100.0 dBm to +20.0 dBm	NAN	dBm	
BurstsOutOfTol	0.0 % to 100.0 %	NAN	%	

Description of command	FW vers.
These commands are always queries. They start a modulation measurement and output all scalar measurement results (see chapter 4), either for the whole burst or for the 1st ten valid symbols in the burst. The calculation of results in an *average* or *peak* measurement is described in chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value.	1.00

CALCulate[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?
CALCulate[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?
Bursts out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
PhErrorPeak (x3),		INV	–	
PhErrorRMS (x3),		INV	–	
MagnErrorPeak (x3),	**For all measured values:**	INV	–	
MagnErrorRMS (x3),				
EVMPeak (x3),		INV	–	
EVMRMS (x3),		INV	–	
	NMAU |NMAL | INV | OK	INV	–	
OriginOffset (x3),		INV	–	
IQImbalance (x3),		INV	–	
FrequencyError (x3)		INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value.	1.00

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Test Object MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* measures the error vector magnitude as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *EVM DQPSK,* and the associated popup menu *Modulation Error Config.*

Control of Measurement – Subsystem MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* controls the modulation measurement. It corresponds to the softkey *EVM DQPSK* in the measurement menu *Modulation*.

INITiate:MODulation:EVMagnitude[:DQPSk]	Start new measurement	*RUN*
ABORt:MODulation:EVMagnitude[:DQPSk]	Abort running measurement and switch off	*OFF*
STOP:MODulation:EVMagnitude[:DQPSk]	Stop measurement after current stat. cycle	*STOP*
CONTinue:MODulation:EVMagnitude[:DQPSk]	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		1.00

CONFigure:MODulation:EVMagnitude[:DQPSk]:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU200 manual).				1.00

FETCh:MODulation:EVMagnitude[:DQPSk]:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE,	No counting mode set	NONE	–	
1 to 1000 |	Counter for current evaluation period within a cycle			
NONE	Statistic count set to off	NONE	–	
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).				1.00

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Spectrum Configuration* menu that are related to the *Error Vector Magnitude* application.

Subsystem MODulation:EVMagnitude[:DQPSk]:CONTrol

The subsystem *MODulation:EVMagnitude[:DQPSk]:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Error Config*.

CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol *<Mode>, <Statistics>*

Scope of Measurement

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | **ARRay**	Only scalar measured values (incl. tolerance matching) Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | **NONE**	No. of bursts within a statistics cycle Statistics off	100	–	

Description of command	FW vers.
This command selects the type of measured values and determines the number of bursts forming one statistics cycle.	1.00

CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol:REPetition *<Repetition> ,<StopCond>,<Stepmode>*

Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	1.00

DISPlay:MODulation:EVMagnitude[:DQPSk]:CONTrol:GRID *<Enable>*				Grid on/off
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	Switch on grid lines Switch off grid lines	ON	–	
Description of command				FW vers.
This command switches the grid lines in the test diagrams on or off.				1.00

CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol:DEFault *<Mode>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				1.00

Tolerance values – Subsystem MODulation:OEMP[:DQPSk]:LIMit

The subsystem *MODulation:OEMP[:DQPSk]:LIMit* (see p. 6.21 ff) defines tolerance values for the modulation measurement **in all four applications**. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:EVMagnitude[:DQPSk] **<Mode>,<Start>,<Samples>{,<Start>,<Samples>}**				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | **ARIThmetical |** **MINimum |** **MAXimum,**	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
6 Symbols to **162 Symbols,**	Start time in current range	6	Symb.	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 157	Number of samples in current range	157	–	
Description of command				FW vers.
This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 symbol period. The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.				1.00

Measured Values – Subsystem MODulation:EVMagnitude[:DQPSk][:RESult]

The subsystem *MODulation:EVMagnitude[:DQPSk][:RESULT]* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation*, application *EVM DQPSK*.

READ[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult][:WBURst]?
READ[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:FTSYmbols? Scalar Results:
Start single shot measurement and return results
FETCh[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult][:WBURst]?
FETCh[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:FTSYmbols?
Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult][:WBURst]?
SAMPle[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:FTSYmbols?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
EVMPeak (x3),	0.0 % to 100.0 %	NAN	%	
EVMRMS (x3),	0.0 % to 100.0 %	NAN	%	
OriginOffset (x3),	–100.0 dB to +100.0 dB	NAN	dB	
IQImbalance (x3),	–100.0 dB to +100.0 dB	NAN	dB	
FrequencyError (x3),	–1000.0 Hz to +1000.0 Hz	NAN	Hz	
MSSyncDetected,	IS1 to IS6 | NONE	NONE	–	
AmplitudeDroop,	–100.0 dB to +100.0 dB	NAN	dB	
Timing Error		NAN	Symb.	
AvgBurstPowerCurr,	–100.0 dBm to +20.0 dBm	NAN	dBm	
BurstsOutOfTol	0.0 % to 100.0 %	NAN	%	

Description of command	FW vers.
These commands are always queries. They start a modulation measurement and output all scalar measurement results (see chapter 4), either for the whole burst or for the 1st ten valid symbols in the burst. The calculation of results in an *average* or *peak* measurement is described in chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	1.00

CALCulate[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?
CALCulate[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?
Bursts out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
EVMPeak (x3),		INV	–	
EVMRMS (x3),	**For all measured values:**	INV	–	
		INV	–	
OriginOffset (x3),				
IQImbalance (x3),	**NMAU |NMAL | INV | OK**	INV	–	
FrequencyError (x3)		INV	–	

Description of command — FW vers. 1.00

This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value. The limits are defined with the `CONFigure:MODulation:OEMP`... commands.

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

READ:ARRay:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]? Phase Error in Burst
READ:ARRay:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?
READ:ARRay:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?
Start single shot measurement and return results *RUN*
FETCh:ARRay:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?
FETCh:ARRay:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?
FETCh:ARRay:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?
Read measurement results (unsynchronized) *RUN*
SAMPle:ARRay:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?
SAMPle:ARRay:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?
SAMPle:ARRay:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?
Read measurement results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to+ 100.0 %,	1st value for error vector magnitude	NAN	%	
... ,	...	...	...	
0.0 % to+ 100.0 %	xth value for error vector magnitude	NAN	%	

Description of command — FW vers. 1.00

These commands are always queries. They return the error vector magnitude vs. time at fixed, equidistant test points. The number of measured values is 157, corresponding to a time range of 6 symbols to 162 symbols.

The calculation of *current, average, and mmax* (Min./Max.) results is explained in chapter 3 (see *display mode*).

READ:SUBarrays:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]? Subarray Results
READ:SUBarrays:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?
READ:SUBarrays:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?
Start single shot measurement and return results *RUN*
FETCh:SUBarrays:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?
FETCh:SUBarrays:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?
FETCh:SUBarrays:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?
Read meas. results (unsynchronized) *RUN*
SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?
SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?
SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?
Read results (synchronized) *RUN*

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to+ 100.0 %,	1st value for error vector magnitude	NAN	%	
… ,	…	…	…	
0.0 % to+ 100.0 %	xth value for error vector magnitude	NAN	%	

Description of command	FW vers.
These commands are always queries. They measure and return the error vector magnitude versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:EVMagnitude[:DQPSk]` command. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, `and SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay..., and SAMPle:ARRay...` command group described above. The `CONFigure:SUBarrays:MODulation:EVMagnitude[:DQPSk]` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in chapter 3 (see *display mode*).	1.00

Test Object MODulation:PERRor

The subsystem *MODulation:PERRor* measures the phase error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Phase Error DQPSK,* and the associated popup menu *Modulation Error Config.*

Control of Measurement – Subsystem MODulation:PERRor

The subsystem *MODulation:PERRor* controls the modulation measurement. It corresponds to the softkey *Phase Error DQPSK* in the measurement menu *Modulation*.

INITiate:MODulation:PERRor[:DQPSk]	Start new measurement	*RUN*
ABORt:MODulation:PERRor[:DQPSk]	Abort running measurement and switch off	*OFF*
STOP:MODulation:PERRor[:DQPSk]	Stop measurement after current stat. cycle	*STOP*
CONTinue:MODulation:PERRor[:DQPSk]	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		1.00

CONFigure:MODulation:PERRor[:DQPSk]:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped (*event reporting,* see chapter 5 of CMU200 manual).				1.00

FETCh:MODulation:PERRor[:DQPSk]:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE,	No counting mode set			
1 to 1000 |	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).				1.00

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Spectrum Configuration* menu that are related to the *Magnitude Error* application.

Subsystem MODulation:PERRor[:DQPSk]:CONTrol

The subsystem *MODulation:PERRor[:DQPSk]:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Error Config*.

CONFigure:MODulation:PERRor[:DQPSk]:CONTrol *<Mode>*, *<Statistics>*				Scope of Measurement
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | **ARRay**	Only scalar measured values (incl. tolerance matching) Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | **NONE**	No. of bursts within a statistics cycle Statistics off	100	–	
Description of command				FW vers.
This command selects the type of measured values and determines the number of bursts forming one statistics cycle.				1.00

CONFigure:MODulation:PERRor[:DQPSk]:CONTrol:REPetition *<Repetition>* ,*<StopCond>*,*<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				1.00

DISPlay:MODulation:PERRor[:DQPSk]:CONTrol:GRID *<Enable>* Grid on/off

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	Switch on grid lines Switch off grid lines	ON	–	

Description of command	FW vers.
This command switches the grid lines in the test diagrams on or off.	1.00

CONFigure:MODulation:PERRor[:DQPSk]:CONTrol:DEFault *<Mode>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	1.00

Tolerance values – Subsystem MODulation:OEMP[:DQPSk]:LIMit

The subsystem *MODulation:OEMP[:DQPSk]:LIMit* (see p. 6.21 ff) defines tolerance values for the modulation measurement **in all four applications**. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation:PERRor[:DQPSk]

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:PERRor[:DQPSk] **<Mode>,<Start>,<Samples>{,<Start>,<Samples>}**				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | **ARIThmetical |** **MINimum |** **MAXimum,**	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
6 Symbols to 162 Symbols,	Start time in current range	6	Symb.	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 157	Number of samples in current range	157	–	
Description of command				FW vers.
This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 symbol period. The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.				1.00

Measured Values – Subsystem MODulation:PERRor[:DQPSk][:RESult]

The subsystem *MODulation:PERRor[:DQPSk][:RESULT]* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation*, application *Phase Error DQPSK*.

READ[:SCALar]:MODulation:PERRor[:DQPSk][:RESult][:WBURst]?
READ[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:FTSYmbols? Scalar Results:
Start single shot measurement and return results

FETCh[:SCALar]:MODulation:PERRor[:DQPSk][:RESult][:WBURst]?
FETCh[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:FTSYmbols?
Read out meas. results (unsynchronized)

SAMPle[:SCALar]:MODulation:PERRor[:DQPSk][:RESult][:WBURst]?
SAMPle[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:FTSYmbols?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
PhErrorPeak (x3),	0.0 % to 100.0 %	NAN	%	
PhErrorRMS (x3),	0.0 % to 100.0 %	NAN	%	
OriginOffset (x3),	–100.0 dB to +100.0 dB	NAN	dB	
IQImbalance (x3),	–100.0 dB to +100.0 dB	NAN	dB	
FrequencyError (x3),	–1000.0 Hz to +1000.0 Hz	NAN	Hz	
MSSyncDetected,	IS1 to IS6 | NONE	NONE	–	
AmplitudeDroop,	–100.0 dB to +100.0 dB	NAN	dB	
Timing Error		NAN	Symb.	
AvgBurstPowerCurr,	–100.0 dBm to +20.0 dBm	NAN	dBm	
BurstsOutOfTol	0.0 % to 100.0 %	NAN	%	

Description of command	FW vers.
These commands are always queries. They start a modulation measurement and output all scalar measurement results (see chapter 4), either for the whole burst or for the 1st ten valid symbols in the burst. The calculation of results in an *average* or *peak* measurement is described in chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value.	1.00

CALCulate[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?
CALCulate[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?
Bursts out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
PhErrorPeak (x3),		INV	–	
PhErrorRMS (x3),	**For all measured values:**	INV	–	
		INV	–	
OriginOffset (x3),				
IQImbalance (x3),	**NMAU |NMAL | INV | OK**	INV	–	
FrequencyError		INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value. The limits are defined with the `CONFigure:MODulation:OEMP`... commands. The following messages may be output for all measured values:	1.00

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

READ:ARRay:MODulation:PERRor[:DQPSk]:CURRent[:RESult]? Phase Error in Burst
READ:ARRay:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?
READ:ARRay:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?
Start single shot measurement and return results *RUN*
FETCh:ARRay:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?
FETCh:ARRay:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?
FETCh:ARRay:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?
Read measurement results (unsynchronized) *RUN*
SAMPle:ARRay:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?
SAMPle:ARRay:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?
SAMPle:ARRay:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?
Read measurement results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 deg to+ 100.0 deg,	1st value for phase error	NAN	deg	
... ,	...	...	...	
–100.0 deg to+ 100.0 deg	xth value for phase error	NAN	deg	

Description of command	FW vers.
These commands are always queries. They return the the phase error vs. time at fixed, equidistant test points. The number of measured values is 157, corresponding to a time range of 6 bit to 162 symbols. The calculation of *current, average, and mmax* (Min./Max.) results is explained in chapter 3 (see *display mode*).	1.00

READ:SUBarrays:MODulation:PERRor[:DQPSk]:CURRent[:RESult]? Subarray Results
READ:SUBarrays:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?
READ:SUBarrays:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?
Start single shot measurement and return results *RUN*

FETCh:SUBarrays:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?
FETCh:SUBarrays:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?
FETCh:SUBarrays:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?
Read meas. results (unsynchronized) *RUN*

SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?
SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?
SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?
Read results (synchronized) *RUN*

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
100.0 deg to+ 100.0 deg,	1st value for phase error	NAN	deg	
... ,	...	...	...	
–100.0 deg to+ 100.0 deg	xth value for phase error	NAN	deg	

Description of command	FW vers.
These commands are always queries. They measure and return the phase error versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:PERRor[:DQPSk]` command. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above. The `CONFigure:SUBarrays:MODulation:PERRor[:DQPSk]` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in chapter 3 (see *display mode*).	1.00

Test Object MODulation:MERRor

The subsystem *MODulation:MERRor* measures the magnitude error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Magn. Error DQPSK,* and the associated popup menu *Modulation Error Config.*

Control of Measurement – Subsystem MODulation:MERRor

The subsystem *MODulation:MERRor* controls the modulation measurement. It corresponds to the softkey *Magn. Error DQPSK* in the measurement menu *Modulation.*

INITiate:MODulation:MERRor[:DQPSk]	Start new measurement	*RUN*
ABORt:MODulation:MERRor[:DQPSk]	Abort running measurement and switch off	*OFF*
STOP:MODulation:MERRor[:DQPSk]	Stop measurement after current stat. cycle	*STOP*
CONTinue:MODulation:MERRor[:DQPSk]	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	1.00

CONFigure:MODulation:MERRor[:DQPSk]:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU200 manual).	1.00

FETCh:MODulation:MERRor[:DQPSk]:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate, CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE,	No counting mode set	NONE	–	
1 to 1000 |	Counter for current evaluation period within a cycle			
NONE	Statistic count set to off	NONE	–	

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).	1.00

Subsystem MODulation:MERRor[:DQPSk]:CONTrol

The subsystem *MODulation:MERRor[:DQPSk]:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Error Config*.

CONFigure:MODulation:MERRor[:DQPSk]:CONTrol *<Mode>, <Statistics>*

Scope of Measurement

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | **ARRay**	Only scalar measured values (incl. tolerance matching) Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | **NONE**	No. of bursts within a statistics cycle Statistics off	100	–	

Description of command	FW vers.
This command selects the type of measured values and determines the number of bursts forming one statistics cycle.	1.00

CONFigure:MODulation:MERRor[:DQPSk]:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>*

Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	1.00

DISPlay:MODulation:MERRor[:DQPSk]:CONTrol:GRID *<Enable>*

Grid on/off

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	Switch on grid lines Switch off grid lines	ON	–	

Description of command	FW vers.
This command switches the grid lines in the test diagrams on or off.	1.00

CONFigure:MODulation:MERRor[:DQPSk]:CONTrol:DEFault ***<Mode>***		Default Settings		
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				1.00

Tolerance values – Subsystem MODulation:OEMP[:DQPSk]:LIMit

The subsystem *MODulation:OEMP[:DQPSk]:LIMit* (see p. 6.21 ff) defines tolerance values for the modulation measurement **in all four applications**. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration*.

Subsystem SUBarrays:MODulation

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:MERRor[:DQPSk] **<Mode>,<Start>,<Samples>{,<Start>,<Samples>}**		Definition of Subarrays		
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | **ARIThmetical |** **MINimum |** **MAXimum,**	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
6 Symbols to **162 Symbols,**	Start time in current range	6	Symb.	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 157	Number of samples in current range	157	–	
Description of command				FW vers.
This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 symbol period. The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.				1.00

Measured Values – Subsystem MODulation:MERRor[:DQPSk][:RESult]

The subsystem *MODulation:MERRor[:DQPSk][:RESULT]* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Magn. Error DQPSK.*

READ[:SCALar]:MODulation:MERRor[:DQPSk][:RESult][:WBURst]?
READ[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:FTSYmbols? Scalar Results:
Start single shot measurement and return results

FETCh[:SCALar]:MODulation:MERRor[:DQPSk][:RESult][:WBURst]?
FETCh[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:FTSYmbols?
Read out meas. results (unsynchronized)

SAMPle[:SCALar]:MODulation:MERRor[:DQPSk][:RESult][:WBURst]?
SAMPle[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:FTSYmbols?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
MErrPeak (x3),	0.0 % to 100.0 %	NAN	%	
MErrRMS (x3),	0.0 % to 100.0 %	NAN	%	
OriginOffset (x3),	–100.0 dB to +100.0 dB	NAN	dB	
IQImbalance (x3),	–100.0 dB to +100.0 dB	NAN	dB	
FrequencyError (x3),	–1000.0 Hz to +1000.0 Hz	NAN	Hz	
MSSyncDetected,	IS1 to IS6 | NONE	NONE	–	
AmplitudeDroop,	–100.0 dB to +100.0 dB	NAN	dB	
Timing Error		NAN	Symb.	
AvgBurstPowerCurr,	–100.0 dBm to +20.0 dBm	NAN	dBm	
BurstsOutOfTol	0.0 % to 100.0 %	NAN	%	

Description of command	FW vers.
These commands are always queries. They start a modulation measurement and output all scalar measurement results (see chapter 4), either for the whole burst or for the 1st ten valid symbols in the burst. The calculation of results in an *average* or *peak* measurement is described in chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	1.00

CALCulate[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?
CALCulate[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?
Bursts out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
MErrPeak (x3),		INV	–	
MErrRMS (x3),	**For all measured values:**	INV	–	
		INV	–	
OriginOffset (x3),				
IQImbalance (x3),	**NMAU |NMAL | INV | OK**	INV	–	
FrequencyError (x3)		INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value. The limits are defined with the `CONFigure:MODulation:OEMP`... commands. The following messages may be output for all measured values: NMAU Underflow of tolerance value *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK all tolerances matched	1.00

READ:ARRay:MODulation:MERRor[:DQPSk]:CURRent[:RESult]? Phase Error in Burst
READ:ARRay:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?
READ:ARRay:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?
Start single shot measurement and return results *RUN*
FETCh:ARRay:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?
FETCh:ARRay:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?
FETCh:ARRay:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?
Read measurement results (unsynchronized) *RUN*
SAMPle:ARRay:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?
SAMPle:ARRay:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?
SAMPle:ARRay:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?
Read measurement results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to+ 100.0 %,	1st value for magnitude error	NAN	%	
... ,	...	...	...	
0.0 % to+ 100.0 %	xth value for magnitude error	NAN	%	

Description of command	FW vers.
These commands are always queries. They return the magnitude error vs. time at fixed, equidistant test points. The number of measured values is 157, corresponding to a time range of 6 bit to 162 symbols. The calculation of *current, average, and mmax* (Min./Max.) results is explained in chapter 3 (see *display mode*).	1.00

Subarray Results

READ:SUBarrays:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?
READ:SUBarrays:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?
READ:SUBarrays:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?

Start single shot measurement and return results *RUN*

FETCh:SUBarrays:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?
FETCh:SUBarrays:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?
FETCh:SUBarrays:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?

Read meas. results (unsynchronized) *RUN*

SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?
SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?
SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?

Read results (synchronized) *RUN*

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to+ 100.0 %,	1st value for magnitude error	NAN	%	
... ,	...	...	...	
0.0 % to+ 100.0 %	xth value for magnitude error	NAN	%	

Description of command	FW vers.
These commands are always queries. They measure and return the magnitude error versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:MERRor[:DQPSk]` command. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above. The `CONFigure:SUBarrays:MODulation:MERRor[:DQPSk]` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in chapter 3 (see *display mode*).	1.00

Test Object SPECtrum

The subsystem *SPECtrum[:ACPower]* measures the off-carrier power of the IS-136 signal. The subsystem corresponds to the measurement menu *Spectrum* and the associated configuration popups.

Control of Measurement – Subsystem SPECtrum[:ACPower]

The subsystem *SPECtrum[:ACPower]* controls the *Spectrum* measurement.

INITiate:SPECtrum[:ACPower]	Start new measurement	*RUN*
ABORt:SPECtrum[:ACPower]	Abort running measurement and switch off	*OFF*
STOP:SPECtrum[:ACPower]	Stop measurement after current stat. cycle	*STOP*
CONTinue:SPECtrum[:ACPower]	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status indicated in the top right column.		1.00

CONFigure:SPECtrum[:ACPower]:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting*, see chapter 5 of CMU200 manual).				1.00

FETCh:SPECtrum[:ACPower]:STATus?				Measurement Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	–
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE,	No counting mode set	NONE	–	–
1 to 1000 |	Counter for current evaluation period within a cycle			
NONE	Statistic count set to off	NONE	–	–
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).				1.00

Test Configuration

The commands of the following subsystems configure the *Spectrum* measurement. They correspond to the *Spectrum Configuration* menu.

Subsystem SPECTrum[:ACPower]:CONTrol

The subsystem *SPECtrum[:ACPower]:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Spectrum Configuration*.

CONFigure:SPECtrum[:ACPower]:CONTrol *<Mode>,<Statistics>* Scope of Measurement

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | **ARRay**	Only scalar measured values Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | **NONE**	Number of bursts per statistics cycle Statistics off (equivalent to 1)	200	–	
Description of command				FW vers.
This command restricts the type of measured values and determines the number of bursts within a statistics cycle.				1.00

CONFigure:SPECtrum[:ACPower]:CONTrol:REPetition *<Repetition>,<StopCondition>,<Stepmode>* Test cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCondition>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
This command defines the number of test cycles, the stepping mode and, if required, a stop condition for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				1.00

CONFigure:SPECtrum[:ACPower]:CONTrol:ACHannel <*Adj_Channel*> Time Domain Adjacent Channel

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
–3 to –1 | +1 to +3	Adjacent channel no.	–3	–	
Description of command				FW vers.
This command selects the adjacent channel for time-domain representation.				1.00

DISPlay:SPECtrum[:ACPower]:CONTrol:GRID <*Enable*> Grid on/off

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	Switch on grid lines Switch off grid lines	ON	–	
Description of command				FW vers.
This command switches the grid lines in the test diagrams on or off.				1.00

CONFigure:SPECtrum[:ACPower]:CONTrol:DEFault <*Mode*> Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	All the parameters of the subsystem are set to default values	ON	–	
OFF	At least one parameter of the subsystem differs from its default value			
Description of command				FW vers.
If used as a setting command with the parameter *ON*, this command sets all the parameters of the subsystem to their default values (*OFF* has no effect). In the query format, the command returns *ON* if all the parameters of the subsystem correspond to their default values, otherwise it returns *OFF*.				1.00

Subsystem SPECTrum[:ACPower]:LIMit

The subsystem *SPECtrum[:ACPower]:LIMit* defines the limit lines, i.e. the tolerance values for the spectrum due to modulation measurement The subsystem corresponds to the *due to Modulation* sections in the tab *Limit Lines* in the popup menu *Spectrum Configuration.*

CONFigure:SPECtrum[:ACPower]:LIMit:CHN<nr>:ENABle <Enable>
CONFigure:SPECtrum[:ACPower]:LIMit:CHN<nr> *<LevelPeak>, <LevelRMS>,<Enable>*

Limits

Numeric Suffix	Value range	Description of parameters	Def. value
<nr>	1 to3	Measurement point (channel) no.	
Parameters	**Value range**	**Description of parameters**	**Def. value**
<Enable>	ON | OFF	Limit check in channel <nr> on/off	See below
<LevelPeak>, ***<LevelRMS>,*** ***<Enable>***	–99.9 dB to 99.9 dB –99.9 dB to 99.9 dB ON | OFF	Limit for peak power Limit for effective power Limit check in channel <nr> on/off	

Description of command — FW vers. 1.00

These commands activate and define limit lines for the spectrum measurement. The numbers <nr> denote the (lower) adjacent channel, the first and second alternate channel (<nr> = 1 to 3, carrier frequency – <nr> * 30 kHz). The `:ENABle` command is suitable for reactivating a limit line area that was previously defined and disabled.

Default values for IS-136 800 and IS-136 1900:

<nr>	Frequency from carrier	<LevelPeak>	<LevelRMS>
1	+30 kHz	–26 dB	–26 dB
2	+60 kHz	–45 dB	–45 dB
3	+90 kHz	–45 dB	–45 dB

CONFigure:SPECtrum[:ACPower]:LIMit:CHP<nr>:ENABle <Enable>
CONFigure:SPECtrum[:ACPower]:LIMit:CHP<nr> *<LevelPeak>, <LevelRMS>,<Enable>*

Limits

Numeric Suffix	Value range	Description of parameters	Def. value
<nr>	1 to3	Measurement point (channel) no.	
Parameters	**Value range**	**Description of parameters**	**Def. value**
<Enable>	ON | OFF	Limit check in channel <nr> on/off	See below
<LevelPeak>, ***<LevelRMS>,*** ***<Enable>***	–99.9 dB to 99.9 dB –99.9 dB to 99.9 dB ON | OFF	Limit for peak power Limit for effective power Limit check in channel <nr> on/off	

Description of command — FW vers. 1.00

These commands activate and define limit lines for the spectrum measurement. The numbers <nr> denote the (upper) adjacent channel, the first and second alternate channel (<nr> = 1 to 3, carrier frequency + <nr> * 30 kHz). The `:ENABle` command is suitable for reactivating a limit line area that was previously defined and disabled.

Default values for IS-136 800 and IS-136 1900:

<nr>	Frequency from carrier	<LevelPeak>	<LevelRMS>
1	–30 kHz	–26 dB	–26 dB
2	–60 kHz	–45 dB	–45 dB
3	–90 kHz	–45 dB	–45 dB

CONFigure:SPECtrum[:ACPower]:LIMit:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	All the parameters of the subsystem are set to default values	ON	–	
OFF	At least one parameter of the subsystem differs from its default value			

Description of command	FW vers.
If used as a setting command with *ON*, this command sets all the parameters of the subsystem to their default values (*OFF* has no effect). In the query format, the command returns *ON* if all the parameters of the subsystem correspond to their default values, otherwise it returns *OFF*.	1.00

Subsystem SUBarrays:SPECtrum[:ACPower]:TDOMain

The subsystem *SUBarrays:SPECtrum[:ACPower]:TDOMain* defines the measurement range in the *ACP Time Domain* application.

CONFigure:SUBarrays:SPECtrum[:ACPower]:TDOMain[:DQPSk]
<Mode>,<Start>,<Samples>{,<Start>,<Samples>} Definition of Subarrays

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | **ARIThmetical |** **MINimum |** **MAXimum,**	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	–
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
–27 Symbols to +190 Symbols	Start time in current range	–27	Symb.	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 872	Number of samples in current range	872	–	

Description of command	FW vers.
This command configures the `READ:SUBarrays:POWer...`, `FETCh:SUBarrays:POWer...`, and `SAMPle:SUBarrays:POWer` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points; the spacing of the test points is given by the fixed oversampling factor of 4 samples per symbol. The subranges may overlap but must be within the total range of the *SPECtrum:TDOMain* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.	1.00

Measured Values

The commands of the following subsystems determine and return the results of the spectrum due to modulation measurement. They correspond to the graphical menu *Spectrum* with its various display elements.

Subsystem SPECtrum[:ACPower][:RESult]

The subsystem *SPECtrum[:ACPower][:RESult]* measures and returns the frequency spectum (due to modulation) and compares it with tolerance values. The subsystem corresponds to the graphical measurement menu *Spectrum*.

READ[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]? Scalar Results:

Start single shot measurement and return results

FETCh[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?

Read measurement results (unsynchronized)

SAMPle[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?

Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
MSPowerPeak,	–100.0 dBm to +100.0 dBm	NAN	dBm	
MSPowerRMS,	–100.0 dBm to +100.0 dBm	NAN	dBm	
ACPowerPeak (–3 to +3),	–100.0 dBm to +100.0 dBm	NAN	dBm	
ACPowerRMS (–3 to +3),	–100.0 dBm to +100.0 dBm	NAN	dBm	
ACPPeak (Peak) (–3 to +3),	–100.0 dBm to +100.0 dBm	NAN	dBm	
ACPPeak (RMS) (–3 to +3),	–100.0 dBm to +100.0 dBm	NAN	dBm	
ACPAvg (RMS) (–3 to +3),	–100.0 dBm to +100.0 dBm	NAN	dBm	
OutOfTolerance	0.0% to 100.0%	NAN	%	

Description of command — FW vers. 1.00

These commands are always queries. They return the following scalar quantities describing the radiated power in the designated radio channel and the adjacent channels. The symbol (–3 to +3) behind a value indicates that the list contains six results corresponding to the alternate channel nos. –3 to –1 and +1 to +3.

MSPowerPeak	*Average power of current burst*
MSPowerRMS	*Effective power of current burst*
ACPPowerPeak	*Peak alternate channel power*
ACPPowerRMS	*Effective alternate channel power*
ACPPeak (Peak)	*Maximum of all ACPPowerPeak values in the measurement*
ACPPeak (RMS)	*Maximum of all ACPPowerRMS values in the measurement*
ACPAvg (RMS)	*Average of all ACPPowerRMS values in the measurement*
OutOfTolerance	*Percentage of bursts out of tolerance*

CALCulate[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]:MATChing:LIMit?

Bursts out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
ACPowerPeak (–3 to +3),	**For all measured values:**	INV	–	
ACPowerRMS (–3 to +3),		INV	–	
ACPPeak (Peak) (–3 to +3),	**NMAU | NMAL | INV | OK**	INV	–	
ACPPeak (RMS) (–3 to +3),		INV	–	
ACPAvg (RMS) (–3 to +3)		INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (–3 to +3) behind a value indicates that the list contains six results corresponding to the alternate channel nos. –3 to –1 and +1 to +3.	1.00

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

READ:ARRay:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]? Burst Power
READ:ARRay:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?
READ:ARRay:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?
READ:ARRay:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?
Start single shot measurement and return results *RUN*
FETCh:ARRay:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?
FETCh:ARRay:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?
FETCh:ARRay:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?
FETCh:ARRay:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?
Read meas. results (unsynchronized) *RUN*
SAMPle:ARRay:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?
SAMPle:ARRay:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?
SAMPle:ARRay:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?
SAMPle:ARRay:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?
Read results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 dBm... + 20.0 dBm,	BurstPower[1], 1st value for burst power	NAN	dB	
...	...	...	...	
–100.0 dBm... + 20.0 dBm	BurstPower[x], xth value for burst power	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the burst power versus time (application *ACP Time Domain)* in the adjacent channel selected via `CONFigure:SPECtrum[:ACPower]:Control:ACHannel` at fixed, equidistant test points. The number of measured values is 872 corresponding to an oversampling factor of 4.	1.00

The calculation of results in the modes *current, average, maximum* and *minimum* is explained in chapter 3 (see *display modes*).

READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]? **READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?** **READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?** **READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?**				Subarray Results
	Start single shot measurement and return results			*RUN*
FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]? **FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?** **FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?** **FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?**				
	Read meas. results (unsynchronized)			*RUN*
SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]? **SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?** **SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?** **SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?**				
	Read results (synchronized)			*RUN*
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 dBm... + 20.0 dBm,	BurstPower[1], 1st value for burst power	NAN	dB	
...	...	...	...	
–100.0 dBm... + 20.0 dBm	BurstPower[x], xth value for burst power	NAN	dB	
Description of command				FW vers.
These commands are always queries. They output the burst power versus time in the adjacent channel selected via `CONFigure:SPECtrum[:ACPower] :Control:ACHannel` and in the subranges defined by means of the `CONFigure:SUBarrays:POWer` command. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above. The `CONFigure:SUBarrays:SPECtrum` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current, average, minimum*, and *maximum* results is explained in chapter 3 (see *display mode*).				1.00

Test Object Receiver Quality

The subsystem *Receiver Quality* comprises the commands for all measurements of the receiver quality. The settings are used to assess the sensitivity of the MS receiver. The subsystem corresponds to the main menu *Receiver Quality*.

Test Object Receiver Quality – Single Shot

The subsystem *RXQuality:BER* contains the commands for receiver quality measurements in the single shot mode. The subsystem corresponds to the main menu *Receiver Quality*.

Control of Measurement – Subsystem RXQuality:BER

The subsystem *RXQuality:BER* controls the single shot receiver quality measurements.

INITiate:RXQuality:BER	Start new measurement	*RUN*
ABORt:RXQuality:BER	Abort running measurement and switch off	*OFF*
STOP:RXQuality:BER	Stop measurement	*STOP*
CONTinue:RXQuality:BER	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands do not exist as queries. They start or stop the current single shot measurement, setting it to the status indicated in the top right column.	1.00

CONFigure:RXQuality:BER:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SRSQ			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped (*event reporting*, see chapter 5).	1.00

FETCh:RXQuality:BER:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	–
RUN |	Running (after `INITiate, CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 500 |	Counter for current evaluation period (frame)	NONE	–	–
NONE	Statistic count set to off (only 1 frame)			

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see chapter 5).	1.00

Subsystem RXQuality:BER:CONTrol

The subsystem *RXQuality:BER:CONTrol* sets the control parameters for the single shot receiver quality measurements. The subsystem corresponds to the softkeys *Frames* and *BER Level* in the measurement menu *Receiver Quality*.

CONFigure:RXQuality:BER:CONTrol:TSETup1:FRAMes *<FramesToSend>*				Frames
<FramesToSend>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 500 | **NONE**	No. of frames to be sent No average (only 1 frame considered)	100	–	
Description of command				FW vers.
This command defines the measured value and the number of frames to be sent in a single shot measurement, constituting a statistics cycle. The suffix <nr> refers to the selected test setup (<nr> = 1 to 10). For definition of the measured value (BER, RFER etc.) see chapter 4.				1.00

CONFigure:RXQuality:BER:CONTrol:TSETup1[:DTC]:LEVel *<Level>*				TCH BER Level, Used Timeslot
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–137 dBm to –27 dBm **–137 dBm to –10 dBm** **–90 dBm to +13 dBm**	RF1 level in used timeslot RF2 level in used timeslot RF3 OUT level in used timeslot	–80	dBm	
Description of command				FW vers.
This command defines the absolute level of the traffic channel (*DTC*) in the used timeslot for the single shot application <nr>. This level applies to the receiver quality measurement only. The default setting depends on the application (all level values in dBm).				1.00

Subsystem RXQuality:BER:LIMit

The subsystem *RXQuality:BER:LIMit* defines tolerance values for the single shot receiver quality measurements. The subsystem corresponds to the *Limit* softkey in the measurement menu *Receiver Quality.*

CONFigure:RXQuality:BER:LIMit:TSETup<nr>:ABITs *<Limit>*				Limit
<ClassIBER>	Description of parameters	Def. value	Def. unit	Unit ring
0 % to 100 %	Upper limit of bit error rate	2.0	%	Ratio
Description of command				FW vers.
This command defines an upper limit for the bit error rate in application <nr>. Irrespective of the application, the default setting is 2 %.				1.00

Measured Values – Subsystem RXQuality:BER[:RESult]

The subsystem *RXQuality:BER[:RESULT]* returns all results of the *Receiver Quality* measurement. In particular, it measures and outputs the bit error rate and compares it with the tolerance values.

	Scalar Results:
READ[:SCALar]:RXQuality:BER[:RESult]?	Start single shot measurement and return results
FETCh[:SCALar]:RXQuality:BER[:RESult]?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:RXQuality:BER[:RESult]?	Read out measurement results (synchronized)

Returned Values	Value range	Def. value	Def. unit	Unit ring
ProgressTime,		NAN	s	
BitErrorRate,	0.0% to 100.0%	NAN	%	
Bit Errors,		NAN	–	
BERMatching,	PASS | FAIL | INV	INV	–	
FramesTr,	0 to 500	NAN	–	
MSPower,	–4 dBm to 36 dBm	INV	dBm	
CarrFreqErr,		NAN	Hz	
MSSyncDet,	IS1 to IS6 | OFF	INV	–	
MSSync@	0% to 100%	NAN	%	

Description of command	FW vers.
These commands are always queries. They start a bit-error-rate test in the single shot repetition mode and output the measurement results (see also detailed explanation of measured values in chapter 4). The results are	1.00

ProgressTime	Measurement time in s
BitErrorRate	Measured bit error rate for all bits
BitErrors	Total number of bit errors detected
FramesTr	Total number of frames transmitted
MSPower	Effective radiated power of the mobile station
CarrFreqErr	Carrier frequency error
MSSyncDet	IS 136 synchronization pattern detected
MSSync@	Percentage of bursts with synchronization pattern <MSSyncDet>

CALCulate[:SCALar]:RXQuality:BER[:RESult]:MATChing?	Limit Matching

Returned Value	Value range	Def. value	Def. unit	Unit ring
BitErrorRate	PASS | FAIL | INV	INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the permissible error limit for the measured values of the bit error rate test (see command above) has been exceeded. The following messages can be returned:	1.00

FAIL	Tolerance exceeded	*not matching, underflow*
INV	Invalid measurement	*invalid*
PASS	all tolerances matched	

TDMA Mobile Tests (Signalling Mode)

In the *Signalling* mode, the CMU is able to generate DCCH and DTC signals and to set up a call to the mobile. A broad range of signalling parameters can be configured and measurements may be performed with a call connection established.

Channel Units – System UNIT

The remote-control commands in the *UNIT* system control the default physical units to be used in certain groups of commands. Default units defined by a *UNIT* command are superseded by an explicit unit definition in one of the associated commands.

UNIT:CHANnel <*Unit*>				RF Channel Units
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
CH | **HZ | KHZ | MHZ | GHZ**	IS 136 channel numbers Frequency units	CH	–	
Description of command			Sig. State	FW vers.
This command defines the default unit for all RF channel specifications. This includes the input and output signals in the control channels and voice channels.			all	1.00

Group Configuration

The remote-control commands in this section are used to configure the measurements in the menu group *IS 136 800/1900-MS Signalling* globally. They correspond to the settings in the popup menu of the softkey *Group Config.* located to the left of the headline of each main menu.

Subsystem LEVel (Input Level)

The subsystem *LEVel* determines or modifies the input level for the currently used input. It corresponds to the index card *Input Level* in the popup menu *Group Configuration*.

[SENSe:]LEVel:MODE <*Mode*>				Input level – Mode
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
MANual | **DMAC**	Manual setting of max. input level According to attenuation code of the mobile	DMAC	–	–
Description of command			Sig. State	FW vers.
This command defines the mode for setting the maximum input level.			all	1.00

[SENSe:]LEVel:MAXimum <*Level*> Max. Level

<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0 dBm to +53 dBm	Maximum input level for RF 1	+30.0	dBm	
–14 dBm to 39 dBm	Maximum input level for RF 2	+30.0	dBm	
–37 dBm to 0 dBm	Maximum input level for RF 4 IN	0.0	dBm	

Description of command	Sig. State	FW vers.
This command defines the maximum input level. The permissible value range depends on the RF input used and the external attenuation set (see `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]` command).	all	1.00

[SENSe:]LEVel:ATTenuation <*Mode*> Attenuation

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NORMal |	Mixer level in normal range	NORMal	–	–
LNOise |	Low noise (mixer level 10 dB higher than in normal setting)			
LDIStortion	Low distortion (mixer level 10 dB lower than in normal setting)			

Description of command	Sig. State	FW vers.
This command tunes the RF analyzer for normal setting, low noise level (full dynamic range), or low distortion (high intermodulation spacing).	all	1.00

[SENSe:]LEVel:DEFault Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	–
OFF	Some or all parameters differ from the default values			

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	all	1.00

Subsystem TRIGger (Trigger Mode)

The subsystem *TRIGger* defines the trigger mode. It corresponds to the index card *Trigger* in the popup menu *Group Configuration.*

TRIGger[:SEQuence]:SOURce <*Source*> Source

<Source>	Description of parameters	Def. value	Def. unit	Unit ring
SIGNalling |	The measurement is triggered by the signalling unit	SIGN	–	–
FRUN |	Trigger by TDMA burst detected by instrument software			
RFPower |	Wide-band power trigger.			
IFPower	Narrow-band trigger.			

Description of command	Sig. State	FW vers.
This command defines the trigger mode. The settings *RFPower* and *IFPower* assume bursted signals.	all	1.00

TRIGger[:SEQuence]:THReshold *<Threshold>* Level

<Threshold>	Description of parameters	Def. value	Def. unit	Unit ring
LOW | **MEDium |** **HIGH**	Low trigger threshold (reference level –26 dB) Medium trigger threshold (ref. level –16 dB) High trigger threshold (reference level –6 dB)	LOW	–	–

Description of command	Sig. State	FW vers.
This command sets the the signal level at which the measurement is triggered (see `TRIG:SEQ:SOUR`). The command is enabled for trigger source `RFPower` and `IFPower` only.	all	1.00

TRIGger[:SEQuence]:DEFault Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	–

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	all	1.00

Connection Control

The remote-control commands presented in this section control the signalling (call setup and release, services, signalling parameters), determine the inputs and outputs as well as the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect. Control* located to the right of the headline of each main menu.

Signalling – Subsystem SIGNalling (Call Setup and Cleardown)

The subsystem *SIGNalling* controls the call setup and cleardown from the CMU to the mobile and determines the signalling parameters. Together with the subsystem *SPOWer* (see below) it corresponds to the different index cards *Signalling* (for different signalling states, see command `PROCedure:SIGNalling:ACTion`) in the popup menu *Connect. Control*.

PROCedure:SIGNalling:ACTion *<Action>*				Signalling Control
<Action>	Description of parameters	Def. value	Def. unit	Unit ring
SOFF | **SON |** **CTM |** **CRELease |** **HANDoff |** **OCALl**	Switch off DCCH signal *(signal off)* Switch on DCCH signal *(signal on)* Call to mobile Call release Handoff Other call	SON	–	–
Description of command			Sig. State	FW vers.
This command changes between the different signalling states of the CMU.			See below	1.00

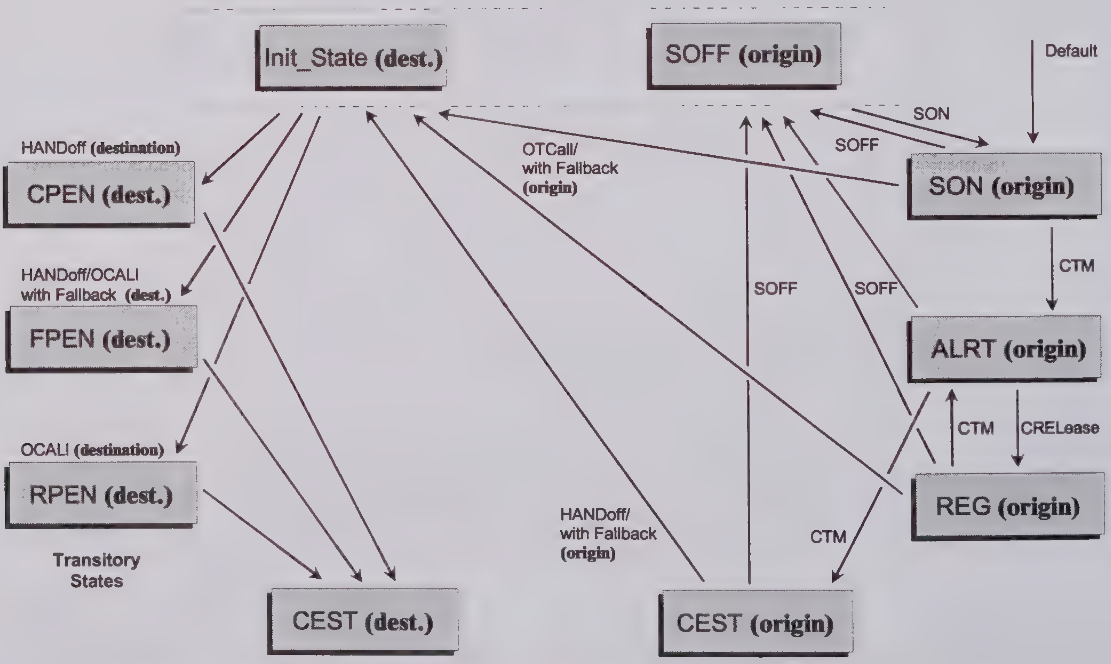
Init_State (dest.)
SOFF (origin)
Default
SON
SOFF
HANDoff (destination)
CPEN (dest.)
OTCall/
with Fallback
(origin)
SON (origin)
CTM
HANDoff/OCALl
with Fallback (dest.)
FPEN (dest.)
SOFF
SOFF
ALRT (origin)
CTM
CRELease
OCALl (destination)
RPEN (dest.)
REG (origin)
HANDoff/
with Fallback
(origin)
CTM
Transitory
States
CEST (dest.)
CEST (origin)

Fig. 6-1: Signalling states of the CMU and transitions including Other Call/Handoff

Signalling states:

See next command, `[SENSe:]SIGNalling:STATe?`

Actions:	*initiated from the CMU:*	*initiated from the mobile phone:*	
	See description of command	MS Synch	Synchronization of mobile phone
		MS MOC	Mobile originated call

Further transitions between the signalling states (not shown in Fig. 6-1) may occur, e.g. in case of errors.

[SENSe:]SIGNalling:STATe? Signalling State

Return	Description of parameters	Def. value	Def. unit	Unit ring
SOFF | **SON |** **REG |** **ALRT |** **CEST |** **CPEN |** **RPEN |** **FPEN**	Signal for synchronization switched off *(Signal Off)* Signal for synchronization switched on *(Signal On)* MS registration performed *(Registered)* Mobile is being called, ringing *(Alerting)* Call to mobile set up *(Call Established)* Call pending *(Handoff* procedures) Registration pending *(Other Call* procedures) Fallback pending *(Other Call/Handoff* procedures)	SON	–	–

Description of command	Sig. State	FW vers.
This command is always a query. It returns the current signalling state.	all	1.00

PROCedure:SIGNalling[:DTC]:CHANnel *<Number>* DTC Channel

<Number>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023	Number of traffic channel, IS 136 800	1	–	
1 to 1999	Number of traffic channel, IS 1361 900	2	–	

Description of command	Sig. State	FW vers.
This command changes the traffic channel number (and thus the frequency) while a call is established.	CEST	1.00

PROCedure:SIGNalling[:DTC]:MAC *<MAC>* DTC MAC

<MAC>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 10	Power of mobile phone in PCL units	6	–	–

Description of command	Sig. State	FW vers.
This command changes the mobile attenuation code (and thus the effective radiated power of the mobile phone) while a call is established. For an overview of MACs see chapter 4.	CEST	1.00

PROCedure:SIGNalling[:DTC]:SLOTconfig *<Config>* DTC Slot Config.

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
C14 | C25 | C36	Pair of timeslos (1&4 or 2&5 or 3&6)	C14	–	–

Description of command	Sig. State	FW vers.
This command specifies the two timeslots that are paired to form a full-rate TDMA traffic channel.	CEST	1.00

Subsystem HANDoff (Handoff Target)

The subsystem *HANDoff* sets the target for a forced handoff of the mobile phone. The corresponding softkeys are located in the index card *Handoff* in the popup menu *Connect. Control.*

STATus:HANDoff:TARGet:LIST?				Destination List
Response	Description of parameters	Def. value	Def. unit	Unit ring
"IS136800MS", "IS1361900MS", "AMPSMS", "IS136800MSFallback", "IS1361900MSFallback", "AMPSMSFallback"	Target list for IS 136 800/1900 (excluding the origin network)	– –	– –	– –
Description of command			Sig. State	FW vers.
This command is always a query and returns a list of all networks that are available for a handoff. The list depends on the current network. It may be abbreviated depending on the capabilities of the mobile station.			CEST	1.00

CONFigure:HANDoff:TARGet <*Target*>				Destination Selection
<Target>	Description of parameters	Def. value	Def. unit	Unit ring
"IS136800MS" | "IS1361900MS" | "AMPSMS" | "IS136800MSFallback" | "IS1361900MSFallback" | "AMPSMSFallback" |	Possible target for IS 136 800/1900 (excluding the origin network)	NONE	–	–
NONE	No handoff			
Description of command			Sig. State	FW vers.
This command selects a handoff target. The targets available depend on the current network and on the capabilities of the mobile station; see previous command. The query returns `NONE` unless a destination has been selected before. Handoff is initiated via the `PROCedure:SIGNalling:ACTion HANDoff` command.			CEST	1.00

Subsystem BSSignal (Signal of Base Station/CMU)

The subsystem *BSSignal* configures the control and traffic channels for the signals sent by the CMU to the mobile phone. It corresponds to the index card *BS Signal* in the popup menu *Connect. Control.*

CONFigure:BSSignal:DCCH:CHANnel <*DCCH*>				Control Channel (DCCH)
<DCCH>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023	Channel number for IS 136 800	716	–	
1 to 1999	Channel number for IS 1361900	314	–	
Description of command			Sig. State	FW vers.
This command determines the RF channel number for the CMU control channel signals (forward channel DCCH).			SON, SOFF, REG	1.00

CONFigure:BSSignal:DCCH:LEVel *<Level>*				Control Channel RF Level
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–137 dBm to –27 dBm **–137 dBm to –10 dBm** **–90 dBm to +13 dBm**	Absol. level of control channel, RF1 Absol. level of control channel, RF2 Absol. level of control channel, RF 3 OUT	–30 –30 –30	dBm dBm dBm	
Description of command			Sig. State	FW vers.
This command determines the level in the control channel in absolute units.			SON, SOFF, REG	1.00

CONFigure:BSSignal[:DTC]:CHANnel *<DTChannel>*				Traffic Channel (DTC)
<DTChannel>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023 **1 to 1999**	Channel number for IS 136 800 Channel number for IS 1361900	1 2	– –	
Description of command			Sig. State	FW vers.
This command determines the RF channel number for the CMU traffic channel signals (forward channel DTC).			SON, SOFF REG Q: all	1.00

CONFigure:BSSignal[:DTC]:LEVel *<Level>* **PROCedure:BSSignal[:DTC]:LEVel *<Level>***				DTC RF Level
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–137 dBm to –27 dBm **–137 dBm to –10 dBm** **–90 dBm to +13 dBm**	Absol. level of traffic channel, RF1 Absol. level of traffic channel, RF2 Absol. level of traffic channel, RF 3 OUT	–30 –30 –30	dBm dBm dBm	
Description of command			Sig. State	FW vers.
This command determines the level in the traffic channel in absolute units. The `CONFigure...` command is available in the signalling states SOFF, SON, and REG. It configures the traffic channel before it is switched on. The `PROCedure...` command is available in the signalling state CEST. With an established call it changes the CMU traffic channel level, sets the device hardware to the new signal level and continues the measurement.			all	1.00

CONFigure:BSSignal[:DTC]:SLOTconfig *<Config>*				DTC Slot Config.
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
C14 | C25 | C36	Pair of timeslos (1&4 or 2&5 or 3&6)	C14	–	
Description of command			Sig. State	FW vers.
This command specifies the two timeslots that are paired to form a full-rate TDMA traffic channel.			SON, SOFF, REG	1.00

CONFigure:BSSignal:VCODer *<Vocoder>* Voice Coder

<Vocoder>	Description of parameters	Def. value	Def. unit	Unit ring
ACELp | VSELp | **MSELected**	Specific voice coder type Voice coder preferred by the mobile under test	MSEL	–	
Description of command			Sig. State	FW vers.
This command specifies the voice coder used by the CMU.			SON, SOFF, REG	1.00

CONFigure:BSSignal:SPEech *<Mode>* Speech Mode
PROCedure:BSSignal:SPEech *<Mode>*

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ECHO |	*Loop back* in the CMU with delay	ECHO	–	
LOOP	*Loop back* in the CMU with minimal delay			
Description of command			Sig. State	FW vers.
This command determines how the CMU returns data transmitted over the traffic channel to the mobile. The `CONFigure...` command is available in the signalling states SOFF, SON, and REG. It configures the traffic channel before it is switched on. The `PROCedure...` command is available in the signalling state CEST. With an established call it changes the speech mode, resets the device hardware to the new speech mode and continues the measurement.			all	1.00

CONFigure:BSSignal:OCHandoff[:DTC]:CHANnel *<DTChannel>*
Other Call/Handoff: Traffic Channel (DTC)

<DTChannel>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023	Channel number for IS 136 800	1	–	
1 to 1999	Channel number for IS 1361900	2	–	
Description of command			Sig. State	FW vers.
This command determines the RF channel number for the CMU traffic channel signals (forward channel DTC) that comes into effect after an *Other Call* or *Handoff* from another to the current network.			SON, SOFF REG Q: all	1.00

CONFigure:BSSignal:OCHandoff[:DTC]:SLOTconfig *<Config>* Other Call/Handoff: Slot Config.

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
C14 | C25 | C36	Pair of timeslos (1&4 or 2&5 or 3&6)	C14	–	
Description of command			Sig. State	FW vers.
This command specifies the timeslots configuration that comes into effect after an *Other Call* or *Handoff* from another to the current network.			SON, SOFF, REG	1.00

CONFigure:BSSignal:OCHandoff[:DTC]:LEVel <*Level*>		Other Call/Handoff: DTC RF Level		
<*Level*>	Description of parameters	Def. value	Def. unit	Unit ring
–137 dBm to –27 dBm **–137 dBm to –10 dBm** **–90 dBm to +13 dBm**	Absol. level of traffic channel, RF1 Absol. level of traffic channel, RF2 Absol. level of traffic channel, RF 3 OUT	–30 –30 –30	dBm dBm dBm	
Description of command			Sig. State	FW vers.
This command determines the level in the traffic channel in absolute units that comes into effect after an *Other Call* or *Handoff* from another to the current network.			all	1.00

Subsystem NETWork

The subsystem *NETWork* determines the parameters of the radio network and the existing radio link. The subsystem corresponds to the popup menu *Network* in the menu group *Connect. Control.*

Subsystem NETWork:IDENtity

The subsystem *NETWork:IDENtity* defines the identity of the mobile radio network. The subsystem corresponds to the table field *Network Identity* in the popup menu *Network*.

CONFigure:NETWork:IDENtity:SID <*Code*>				SID
<*Code*>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 32767	15-bit system identity code	4	–	–
Description of command			Sig. State	FW vers.
This command defines the system identity code.			SOFF, SON Q: all	1.00

CONFigure:NETWork:IDENtity:MCC <*Code*>				MCC
<*Code*>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 1023	Mobile country code	0	–	–
Description of command			Sig. State	FW vers.
This command defines the mobile country code.			SOFF, SON Q: all	1.00

Subsystem NETWork:SMODe (Signalling Modes)

The subsystem *NETWork:SMODe* defines the signalling parameters controlling the function of the mobile. The subsystem corresponds to the table field *Signalling Modes* in the popup menu *Network*.

CONFigure:NETWork:SMODe:PUReg *<Enable>* Power-Up

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Registration on power-up of the mobile on/off	ON	–	–
Description of command			Sig. State	FW vers.
This command determines whether a registration procedure is to be executed on power-up of the mobile.			SOFF, SON REG Q: All	1.00

CONFigure:NETWork:SMODe:PDReg *<Enable>* Power-Down

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Registration on power-down of the mobile on/off	ON	–	–
Description of command			Sig. State	FW vers.
This command determines whether a registration procedure is to be executed on power-down of the mobile.			SOFFS ON REG Q: All	1.00

CONFigure:NETWork:SMODe:SYReg *<Enable>* New System

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Registration on change in SID on/off	ON	–	–
Description of command			Sig. State	FW vers.
This command determines whether a registration procedure is to be executed when the system identity is changed.			SOFFS ON REG Q: All	1.00

CONFigure:NETWork:SMODe:DEReg *<Enable>* Deregistration

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Registration on DCCH change	ON	–	–
Description of command			Sig. State	FW vers.
This command determines whether a registration procedure is to be executed when the mobile changes to another DCCH (change of radio cell/BTS).			SOFFS ON REG Q: All	1.00

CONFigure:NETWork:SMODe:IDType *<Type>* MSID Type

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ID20 |	20-bit TMSI (temporary mobile station identity)	ID34	–	–
ID24 |	24-bit TMSI (temporary mobile station identity)			
ID34 |	34-bit MIN (mobile identification number)			
ID50	50-bit IMSI (international mobile subscriber identity)			

Description of command	Sig. State	FW vers.
This command determines which type of mobile station identity is to be used for call setup to the mobile phone.	SOFFS ON REG Q: All	1.00

CONFigure:NETWork:SMODe:ID<nr> *<TMSI>* TMSI

<TMSI>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 1048575	20-bit TMSI (temporary mobile station identity)	0	–	–
0 to 16777215	24-bit TMSI (temporary mobile station identity)	0		

Description of command	Sig. State	FW vers.
This command defines a 20-bit (<nr> = 20) or a 24-bit (<nr> = 24) default TMSI used to set up a call to the mobile phone.	SOFFS ON REG Q: All	1.00

CONFigure:NETWork:SMODe:IDMin *<MIN>* MIN

<MIN>	Description of parameters	Def. value	Def. unit	Unit ring
0 to $2^{34} - 1$	34-bit MIN (mobile identification number)	0	–	–

Description of command	Sig. State	FW vers.
This command defines the default MIN used to set up a call to the mobile phone.	SOFFS ON REG Q: All	1.00

CONFigure:NETWork:SMODe:IDIMsi *<MIN>* IMSI

<MIN>	Description of parameters	Def. value	Def. unit	Unit ring
0 to $2^{50} - 1$	50-bit IMSI (international mobile subscriber identity)	0	–	–

Description of command	Sig. State	FW vers.
This command defines the default IMSI used to set up a call to the mobile phone.	SOFFS ON REG Q: All	1.00

Subsystem NETWork:REQuest (Requested Mobile Data)

The subsystem *NETWork:REQuest* determines the signalling parameters of the mobile to be requested. The subsystem corresponds to the table field *Requested Mobile Data* in the popup menu *Network*.

CONFigure:NETWork:REQuest:SNUMber *<Enable>* Serial Number Request

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Request of the mobile's serial number or no request	ON	–	–
Description of command			Sig. State	FW vers.
This command determines whether the serial number of the mobile phone is requested during registration.			SOFF, SON REG Q: all	1.00

CONFigure:NETWork:REQuest:CAPability *<Enable>* Capability Report Request

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Request of the mobile's capability report or no request	ON	–	–
Description of command			Sig. State	FW vers.
This command determines whether the capability report of the mobile phone is requested during registration.			SOFF, SON REG Q: all	1.00

Subsystem NETWork[:MS] (Mobile Settings)

The subsystem *NETWork[:MS]* defines the mobile parameters. The subsystem corresponds to the table field *Mobile Settings* in the popup menu *Network*.

CONFigure:NETWork[:MS]:SUFF *<Level>* SS SUFF

<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–∞ |	Channel reselection disabled	–∞	dBm	
–111 dBm to –51 dBm	Received signal strength, in 2-dB steps			
Description of command			Sig. State	FW vers.
This command defines the SS SUFF. This information element identifies the minimum signal strength deemed sufficient for control channel reselection.			SOFF, SON REG Q: all	1.00

CONFigure:NETWork[:MS]:DCCMac *<MAC>* DCCH MAC

<MAC>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 7	Mobile attenuation code	6	–	
Description of command			Sig. State	FW vers.
This command defines the mobile attenuation code (MAC) for control channel signals. An overview of MAC levels in IS 136 and the corresponding effective radiated powers is given in chapter 4.			SOFF, SON REG Q: all	1.00

CONFigure:NETWork[:MS]:DTCMac *<MAC>* DTC MAC

<MAC>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 10	Mobile attenuation code	6	–	

Description of command	Sig. State	FW vers.
This command defines the mobile attenuation code (MAC) for traffic channel signals. An overview of MAC levels in IS 136 and the corresponding effective radiated powers is given in chapter 4.	SOFF, SON REG Q: all	1.00

CONFigure:NETWork[:MS]:RAMin *<Level>* RSS ACC MIN

<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–∞ |	DCCH access always possible	–∞	dBm	
–111 dBm to –51 dBm	Received signal strength, in 2-dB steps			

Description of command	Sig. State	FW vers.
This command defines the RSS ACC MIN. This information element identifies the minimum signal strength at the mobile required to access a DCCH.	SOFF, SON REG Q: all	1.00

CONFigure:NETWork[:MS]:DELay *<Level>* Delay

<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0 superfr. to 105 superfr. |	Delay time, in 15-superframe steps	0	Superfr	
105 superfr. to 420 superfr.	Delay time, in 45-superframe steps			

Description of command	Sig. State	FW vers.
This command defines the Delay. This information element identifies the time that the mobile must obtain service on the current DCCH before considering DCCH reselection.	SOFF, SON REG Q: all	1.00

CONFigure:NETWork[:MS]:DIC *<Channel>* DIC Application Domain

<Channel>	Description of parameters	Def. value	Def. unit	Unit ring
DCCH |	Control channel	DCCH	–	
DTC	Traffic			

Description of command	Sig. State	FW vers.
This command defines the DIC (delay interval compensation) domain.	SOFF, SON REG Q: all	1.00

CONFigure:NETWork[:MS]:SCANinterval *<Interval>* Scan Interval

<Interval>	Description of parameters	Def. value	Def. unit	Unit ring
1 hyperfr. to 16 hyperfr.	Scan interval	1	Hyperfr.	

Description of command	Sig. State	FW vers.
This command defines the Scan Interval, i.e. the time between two consecutive signal strength measurements on candidate control channels for reselection purposes.	SOFF, SON REG Q: all	1.00

CONFigure:NETWork[:MS]:SBINdicator <*Type*> Shortened Burst Indicator

<Type>	Description of parameters	Def. value	Def. unit	Unit ring
NORMal | **SHORtened**	Normal burst Shortened burst	NORMal	–	

Description of command	Sig. State	FW vers.
This command determines which DCCH burst type is transmitted after a handoff.	SOFF, SON REG Q: all	1.00

Subsystem NETWork:SYSTem (System Parameters)

The subsystem *NETWork:System* determines system parameters for the radio connection. The subsystem corresponds to the table field *System Parameters* in the popup menu *Network*.

CONFigure:NETWork:SYSTem:NOFSlots <*Slots*> No. of FBCCH Slots

<Slots>	Description of parameters	Def. value	Def. unit	Unit ring
5 Slots to 10 Slots	FBCCH Slots	5	Slots	

Description of command	Sig. State	FW vers.
This command defines the number of Fast Broadcast Control Channel (FBCCH) slots per superframe.	SOFF, SON, REG Q: all	1.00

CONFigure:NETWork:SYSTem:NOESlots <*Slots*> No. of EBCCH Slots

<Slots>	Description of parameters	Def. value	Def. unit	Unit ring
1 Slots to 8 Slots	EBCCH Slots	1	Slots	

Description of command	Sig. State	FW vers.
This command defines the number of Extended Broadcast Control Channel (EBCCH) slots per superframe.	SOFF, SON, REG Q: all	1.00

CONFigure:NETWork:SYSTem:CCSDvcc <*Slots*> Color Code SAT DVCC

<Slots>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 255	8-bit color code	255	–	

Description of command	Sig. State	FW vers.
This command defines the Digital Verification Color Code (DVCC) that is used to identify both the DCCH and DTC for call setup and voice (de)coding.	SOFF, SON, REG Q: all	1.00

Subsystem NETWork:TIMeout

The subsystem *NETWork:TIMeout* defines timeouts for dropping an unused radio link or forcing a registration. The subsystem corresponds to the table field *Timeouts* in the popup menu *Network*.

CONFigure:NETWork:TIMeout:LORLINk *<Time>* Loss of Radiolink

<Time>	Description of parameters	Def. value	Def. unit	Unit ring
1 s to 60 s	Radio link timeout	4	s	

Description of command	Sig. State	FW vers.
This command defines the time after which the CMU drops an interrupted connection.	SON, SOFF REG Q: all	1.00

CONFigure:NETWork:TIMeout:RPERiod *<Time>* Registration Period

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
4 s to 3600 s | **OFF**	Timeout for forced registration No forced registration	10	s	

Description of command	Sig. State	FW vers.
This command determines a period of time after which the CMU forces the mobile station to (re-)register. In the setting OFF, no forced registration takes place.	SON, SOFF REG Q: all	1.00

Subsystem NETWork:NCDef

The subsystem *NETWork:NCDef* configures the channel list in the neighbor cells. The subsystem corresponds to the table field *Neighbor Channels* in the popup menu *Network*. If no channel list is defined (default setting), the MAHO list queried via the `[SENSe:]RRXQuality:MAHO...` commands (see p. 6.78) is empty.

CONFigure:NETWork:NCDef *<Channel>*{, *<Channel>*} Neighbor Channels

<Channel>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023 | OFF	Channel number for IS 136 800	OFF, OFF...	–	
1 to 1999 | OFF	Channel number for IS 1361900	OFF, OFF...	–	

Description of command	Sig. State	FW vers.
This command defines the list of up to 24 used channel in the neighbor cells.	SON, SOFF REG Q: all	1.00

CONFigure:NETWork:NCDef:CELL<nr> *<Channel>* Neighbor Channel

<Channel>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023 | OFF	Channel number for IS 136 800	OFF	–	
1 to 1999 | OFF	Channel number for IS 1361900	OFF	–	

Description of command	Sig. State	FW vers.
This command defines the used channel in neighbor cell <nr> where <nr> = 1 to 24.	SON, SOFF REG Q: all	1.00

Subsystem NETWork:OCHandoff

The subsystem *NETWork:OCHandoff* defines parameters that come into effect after an *Other Call* or a *Handoff* from another to the current network. The subsystem corresponds to the table field *Other Call/Handoff Parameter* in the popup menu *Network*.

CONFigure:NETWork:OCHandoff[:MS]:DTCMAC <*MAC*> Other Call/Handoff: DTCMAC

<MAC>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 10	Digital traffic channel attenuation code	6	–	

Description of command	Sig. State	FW vers.
This command determines the DTC MAC that comes into effect after an *Other Call* or *Handoff* from another to the current network.	SON, SOFF REG Q: all	1.00

Subsystem IOConnector (External Attenuation at the Connectors)

The subsystem *IOConnector* contains the commands for configuration of the input and output connectors. The subsystem corresponds to the index card RF ⊶ in the popup menu *Connect. Control*.

INPut[:STATe] <*State*> RF Input

<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 RF2 RF4	Connector RF1 used as input Connector RF2 used as input Connector RF4 IN used as input	RF2	–	–

Description of command	Sig. State	FW vers.
This command determines the connector to be used for RF input signals. The bidirectional connectors RF 1 and RF 2 can be used both as input and output connectors in the same measurement (see `OUTPut[:STATe]`). Only one input and one output may be active at the same time, a new RF input setting supersedes the previous one.	all	1.00

OUTPut[:STATe] <*State*> RF Output

<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 **RF2** **RF3**	Connector RF1 used as output Connector RF2 used as output Connector RF3 OUT used as output	RF2	–	–

Description of command	Sig. State	FW vers.
This command determines the connector to be used for RF output signals. The bidirectional connectors RF 1 and RF 2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`). Only one input and one output may be active at the same time, a new RF output setting supersedes the previous one.	all	1.00

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*>
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*> Ext. Att. Input

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB	Value for external attenuation at the input <nr>, where <nr> = 1,2,4	0.0	dB	–

Description of command	Sig. State	FW vers.
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN).*	all	1.00

[SENSe:]CORRection:LOSS:Output<nr>[:MAGNitude] <*Attenuation*>
SOURce:CORRection:LOSS:Output<nr>[:MAGNitude] <*Attenuation*> Ext. Att. Output

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB	Value for external attenuation at output <nr>, where <nr> = 1,2,3	0.0	dB	Ratio

Description of command	Sig. State	FW vers.
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT).*	all	1.00

Subsystem DM:CLOCk (Synchronization)

The subsystem *DM:CLOCk* sets a system clock specific to the network. This frequency is set in the index card *Synch.* in the popup menu *Connect. Control.*

SOURce:DM:CLOCk:STATe <*Mode*> REF OUT 2 on/off

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on/off system clock	OFF	–	–

Description of command	Sig. State	FW vers.
This command switches the system clock at output *REF OUT 2* on or off.	SOFF Q: all	1.00

SOURce:DM:CLOCk:FREQuency <Frequency> REF OUT 2

<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
9.72 MHz to 38.88 MHz	System clock frequency	12.96	MHz	

Description of command	Sig. State	FW vers.
This command determines the system clock frequency applied to *REF OUT 2*. The frequency entered is internally rounded to one of the following discrete values: 38.88 MHz, 19.44 MHz, 12.96 MHz, 9.72 MHz	SOFF Q: all	1.00

Pseudo Test Object MSSinfo
(Signalling information of mobile phone)

The subsystem *MSSinfo* contains the commands for querying the properties of the mobile phone. The subsystem corresponds to the *Signalling Info* output table in the main menu *IS 136900-MS Overview.* The mobile phone properties do not actually represent measured values, they are provided by the mobile phone during registration.

[SENSe:]MSSinfo:MSID:TYPE? MSID Type

<Returned Value>>	Description of parameters	Def. val.	Def. unit	Unit ring
ID20 | **ID24 |** **MIN |** **IMSI**	20-bit TMSI (temporary mobile station identity) 24-bit TMSI (temporary mobile station identity) 34-bit MIN (mobile identification number) 50-bit IMSI (international mobile subscriber identity)	MIN	–	

Description of command	Sig. State	FW vers.
This command is always a query and determines by which code number the mobile phone is identified.	SOFF SON REG Q: All	1.00

[SENSe:]MSSinfo:MSID:NUMBer? MSID

<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
0 to $2^{50} - 1$	20-bit TMSI, 24-bit TMSI, 34-bit MIN, or 50-bit IMSI, depending on mobile type	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query and returns the mobile station identification number.	SOFF SON REG Q: All	1.00

[SENSe:]MSSinfo:ESN? ESN

<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
0 to $2^{32} - 1$	32-bit Electronic Serial Number (ESN)	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query and returns the Electronic Serial Number (ESN) of the mobile phone.	SOFF SON REG Q: All	1.00

[SENSe:]MSSinfo:PCLaSs? Power Class

<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 4	Power class of the mobile phone	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query and returns the power class of the mobile phone. For a list of IS-136 power classes and mobile attenuation codes refer to chapter 4.	SOFF SON REG Q: All	1.00

[SENSe:]MSSinfo:DTX? DTX Capability

<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
SUPP | NSUP	DTX mode supported or not supported	NSUP	–	

Description of command	Sig. State	FW vers.
This command is always a query and returns the DTX *(Discontinuous Transmission)* capability of the mobile phone.	SOFF SON REG Q: All	1.00

[SENSe:]MSSinfo:BANDwidth? Bandwidth

<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
MH20 | MH25	20 MHz or 25 MHz bandwidth	MH25	–	

Description of command	Sig. State	FW vers.
This command is always a query and returns the width of the whole RF band used.	SOFF SON REG Q: All	1.00

[SENSe:]MSSinfo:PVERsion? Protocol Version

<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
PV0 |	EIA-553 or IS-54-A	INV	–	
PV1 |	TIA/EIA 627			
PV2 |	IS-136 Rev 0			
PV3 |	Permanently Reserved			
PV4 |	IS-136 Rev A			
PV5 |	Unkown			

Description of command	Sig. State	FW vers.
This command is always a query and returns the width of the whole RF band used.	SOFF SON REG Q: All	1.00

[SENSe:]MSSinfo:DNUMber? Dialed Number

<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
"Max. 16 digits"	Number dialed at the mobile	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query and returns the number dialed at the mobile station (Call from MS).	SOFF SON REG Q: All	1.00

[SENSe:]MSSinfo:VCODer? Voice Coder

<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
ACELp | VSELp	Specific voice coder type Voice coder preferred by the mobile	MSEL	–	

Description of command	Sig. State	FW vers.
This command is always a query and returns the voice coder of the mobile station.	SOFF SON REG Q: All	1.00

Test Object WPOWer (Wide Band Power)

The subsystem *WPOWer* contains the commands for measuring the power of the RF input signal using a wide-band filter. It corresponds to the softkey *Power* of the index card *Signalling* in the menu group *Connect. Control.*

INITiate:WPOWer	Start new measurement	*RUN*
ABORt:WPOWer	Abort running measurement and switch off	*OFF*
STOP:WPOWer	Stop measurement after current stat. cycle	*STOP*
CONTinue:WPOWer	Next measurement step (only *stepping mode*)	*RUN*
Description of command	Sig. State	FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status given in the top right column.	all	1.00

CONFigure:WPOWer:EREPorting *<Mode>*				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command			Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting*, see chapter 5).			all	1.00

FETCh:WPOWer:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	–
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE,	No counting mode set	NONE	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).			all	1.00

CONFigure:WPOWer:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>* Test cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	–
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE**	Start measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	–
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	–

Description of command	Sig. State	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always aborted after a single shot.*	all	1.00

READ[:SCALar]:WPOWer[:RESult]? Start single shot measurement and return results
FETCh[:SCALar]:WPOWer[:RESult]? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:WPOWer[:RESults]? Read out measurement results (synchronized)

Return	Description of parameters	Def. value	Def. unit	Unit ring
–30.0 dBm to **+30.0 dBm**	Maximum burst power (not averaged)	NAN	dBm	

Description of command	Sig. State	FW vers.
These commands are always queries. They start the measurement of the maximum burst power of the signals sent by the mobile *(peak burst power)* and output the result.	all	1.00

Pseudo Test Object Receiver Quality – Signalling

The subsystem *Receiver Quality* assesses the receiver quality of the mobile station by retrieving the mobile-assisted handoff (MAHO) report. The subsystem corresponds to the main menu *Receiver Quality*. Display of the MAHO report does not actually represent a measurement as the mobile station provides these values by itself.

The MAHO report is empty unless a list of neighbor channels is defined via the `CONFigure:NETWork:NCDef...` commands.

[SENSe]:RXQuality:MAHO:CQUality:BER?			Channel Quality: BER	
Returned Value	Description of parameters	Def. value	Def. unit	Unit ring
0% to 100%	Measured BER level	NAN	%	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the BER in the serving cell and in the current traffic channel (DTC).			all	1.00

[SENSe]:RXQuality:MAHO:CQUality:RSSI?			Channel Quality: RSSI	
Returned Value	Description of parameters	Def. value	Def. unit	Unit ring
RS0 to RS31	Reported RSSI	NAN	dBm	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the RSSI level in the serving cell and in the current traffic channel (DTC).			all	1.00

[SENSe]:RXQuality:MAHO:NCELls:CELL<nr>?			MAHO, Single Cell	
Returned Values	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023 |	Reported channel in cell <nr>, IS 136 800	NAN	–	
1 to 1999,	Rep. channel in cell <nr>, IS 136 1900	NAN	–	
RS0 to RS31	Reported RSSI in cell <nr>	NAN	dBm	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the reported traffic channel (DTC) number and the RSSI in neighbor cell <nr> where <nr> = 1 to 24.			all	1.00

[SENSe]:RXQuality:MAHO:NCELls?			MAHO, All Cells	
Returned Values	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023 |	Reported channel in cell 1, IS 136 800	NAN	–	
1 to 1999,	Rep. channel in cell 1, IS 136 1900	NAN	–	
RS0 to RS31,	Reported RSSI in cell 1	NAN	dBm	
... ,	...			
1 to 799 | 990 to 1023 |	Reported channel in cell 24, IS 136 800	NAN	–	
1 to 1999,	Rep. channel in cell 24, IS 136 1900	NAN	–	
RS0 to RS31	Reported RSSI in cell 24	NAN	dBm	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the reported traffic channel (DTC) numbers and the RSSIs in 24 neighbor cells.			all	1.00

Test Object POWer[:SBURst]

The subsystem *POWer[:SBURst]* measures the MS output carrier power versus time. The subsystem corresponds to the measurement menu *Power*, application *Short. Burst,* and the associated popup menu *Power Configuration.*

The optional keyword `[:SBURst]` denotes shortened burst measurements that are available in *Signalling* modes only. A second application (normal bursts, [:`NBURst]`) is available in both test modes; the corresponding commands are reported in section *Common Measurement Groups*.

Control of measurement – Subsystem Power

The subsystem *POWer* controls the power measurement.

INITiate:POWer[:SBURst][:DQPSk]	Start new measurement		*RUN*
ABORt:POWer[:SBURst][:DQPSk]	Abort running measurement and switch off		*OFF*
STOP:POWer[:SBURst][:DQPSk]	Stop measurement after current stat. cycle		*STOP*
CONTinue:POWer[:SBURst][:DQPSk]	Next measurement step (only *stepping mode*)		*RUN*
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.		all	1.00

CONFigure:POWer[:SBURst][:DQPSk]:EREPorting *<Mode>*				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command			Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU200 manual).			all	1.00

FETCh:POWer[:SBURst][:DQPSk]:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate, CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE,	No counting mode set			
1 to 1000 |	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).			all	1.00

Subsystem POWer:CONTrol

The subsystem *POWer:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Power Configuration.*

CONFigure:POWer[:SBURst][:DQPSk]:CONTrol *<Mode>, <Statistics>*				Scope of Measurement
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | **ARRay**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | **NONE**	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command			Sig. State	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.			all	≥1.15

CONFigure:POWer[:SBURst][:DQPSk]:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command			Sig. State	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*			all	1.00

DISPlay:POWer[:SBURst][:DQPSk]:CONTrol:GRID *<Enable>*				Grid on/off
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	Switch on the grid lines Switch off the grid lines	ON	–	
Description of command			Sig. State	FW vers.
This command switches the grid lines in the test diagram on or off.			all	1.00

CONFigure:POWer[:SBURst][:DQPSk]:CONTrol:DEFault		Default Settings		
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.			all	1.00

Test Configuration

The commands of the following subsystems determine the parameters of the signal power measurement. They correspond to the *Power Configuration* popup menu. For a detailed explanation of the power tolerance template defined in the GSM standard see chapter 4.

Subsystem POWer:LIMIt:LINE

The subsystem *POWer:LIMit:LINE* defines the limit lines, i.e. the tolerance values for the power measurement. The subsystem corresponds to the tab *Limit Lines* in the popup menu *Power Configuration.*

CONFigure:POWer[:SBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical] :UPPer:AREA<nr>:ENABle *<Enable>* **CONFigure:POWer[:SBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical] :UPPer:AREA<nr> *<LevelRel>, <EnableArea>***				Upper Limit Line
Parameters	Value range	Description of parameters		Def. unit
<Enable>	ON | OFF	Area on/off		See below
<LevelRel>, ***<EnableArea>***	–100 dB to +10 dB, ON | OFF	Relative level Range of limit lines on/off		
Description of command			Sig. State	FW vers.
These commands activate and define upper limit lines for shortened bursts. The limit lines are defined area by area; the suffix <nr> numbers the five areas in the burst diagram (see chapter 4). The `:ENABle` command is suitable for reactivating a limit line area that was previously defined and disabled.			all	1.00

The default settings are given in the table below:

Suffix	EnableArea	LevelRel
1	ON	–60 dB
2	OFF	+6 dB
3	ON	+4 dB
4	OFF	+6 dB
5	ON	–60 dB

The setting EnableArea = Off implies that the corresponding range, including the limit check, is switched off. Enable = Off switches off the entire limit check.

CONFigure:POWer[:SBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer:ENABle *<Enable>*
CONFigure:POWer[:SBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer
<LevelRel>, <EnableArea>

Upper Limit Line

Parameters	Value range	Description of parameters	Def. unit
<Enable>	ON | OFF	Area on/off	
<LevelRel>, *<EnableArea>*	–100 dB to 10 dB, ON | OFF	Relative level Range of limit lines on/off	

Description of command	Sig. State	FW vers.
These commands activate and define the lower limit line for shortened bursts. The default relative level is *LevelRel = –20 dB*. The setting *EnableArea = Off* implies that the corresponding range, including the limit check, is switched off. *Enable = Off* switches off the entire limit check.	all	1.00

CONFigure:POWer[:SBURst][:DQPSk]:LIMit:POINt[:ASYMmetrical]:LPOWer *<Limit>*

Leakage Power Limit

<Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dBm to 0 dBm	Upper limit of leakage power	–60	dBm	

Description of command	Sig. State	FW vers.
This commands defines the upper limit for the leakage power.	all	1.00

CONFigure:POWer[:SBURst][:DQPSk]:LIMit:DEFault

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	the parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* has no effect). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	all	1.00

Subsystem POWer:TIME

The subsystem *POWer:...TIME* contains the command for shifting the burst relative to the time axis (and thus the tolerance template). The subsystem corresponds to the popup window *Time - Mode* in the graphical measurement menu *Power.*

CONFigure:POWer[:SBURst][:DQPSk]:TIME:OVERsampling *<Factor>*

Mode

<Factor>	Description of parameters	Def. value	Def. unit	Unit ring
1 | 8	Oversampling factor; no. of samples per symbol	8	–	

Description of command	Sig. State	FW vers.
This command defines how many samples are taken and displayed per symbol.	all	1.00

Subsystem SUBarrays:POWer

The subsystem *SUBarrays:POWer* defines the measurement range and the type of output values.

CONFigure:SUBarrays:POWer[:SBURst][:DQPSk] **<Mode>,<Start>,<Samples>{,<Start>,<Samples>}**				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | **ARIThmetical |** **MINimum |** **MAXimum,**	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
–20 Symbols to 181 Symbols,	Start time in current range	–20	Symb.	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 182 | **0 to 1456**	No. of samples in range, oversamp. 1 No. of samples in range, oversamp. 8	182 1456	– –	
Description of command				FW vers.
This command configures the `READ:SUBarrays:POWer...`, `FETCh:SUBarrays:POWer...`, and `SAMPle:SUBarrays:POWer` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by a start time and the number of test points which are located on a fixed, equidistant grid. The spacing between the test points is given by the oversampling factor set via `CONFigure:POWer[:SBURst][:DQPSk]:TIME:OVERsampling 1 | 8`. The subranges may overlap but must be within the total range of the *POWer* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.				1.00

Measured Values – Subsystem POWer[:RESult]

The subsystem *POWer[:RESULT]* determines and outputs the results of the signal power measurement. They correspond to the graphical measurement menu *Power* with its various display elements.

READ[:SCALar]:POWer[:SBURst][:DQPSk][:RESult]? Scalar results: Start single shot measurement and return results

FETCh[:SCALar]:POWer[:SBURst][:DQPSk][:RESult]? Read out measurement results (unsynchronized).

SAMPle[:SCALar]:POWer[:SBURst][:DQPSk][:RESult]? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
BurstsOutOfTol,	0.0 % to 100.0 %	NAN	%	
BurstPwCurrPeak,	–100.0 dBm to +20.0 dBm	NAN	dBm	
BurstPwCurrRMS,	–100.0 dBm to +20.0 dBm	NAN	dBm	
LeakPowPeak,	–100.0 dBm to +20.0 dBm	NAN	dBm	
LeakPowRMS,	–100.0 dBm to +20.0 dBm	NAN	dBm	
BurstMatchCurr,	MATC | NMAT | INV | OUT	INV	–	
BurstMatchMin,	MATC | NMAT | INV | OUT	INV	–	
BurstMatchMax,	MATC | NMAT | INV | OUT	INV	–	
BurstMatchAvg	MATC | NMAT | INV | OUT	INV	–	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results (see chapter 5). These are: *Peak power of current burst* *Average power of current burst* *Peak leakage power* *Average leakage power* *Matching of current burst power, average, minimum, and maximum burst power* The calculation of results in an *average* or *peak* measurement is described in chapter 3 (see *display modes*).The following messages may be output for the value *BurstMatch...*: MATC *matching* NMAT *not matching* INV *invalid* OUT *out of range*	all	1.00

CALCulate[:SCALar]:POWer[:SBURst][:DQPSk]:CURRent[:RESult]:MATChing? Limit Matching
CALCulate[:SCALar]:POWer[:SBURst][:DQPSk]:AVERage[:RESult]:MATChing?
CALCulate[:SCALar]:POWer[:SBURst][:DQPSk]:MINimum[:RESult]:MATChing?
CALCulate[:SCALar]:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]:MATChing?

Returned values	Value range	Def. value	Def. unit	Unit ring
BurstPwCurrRMS,	NMAU | NMAL | INV | OK	INV	–	
LeakPowRMS,	NMAU | NMAL | INV | OK	INV	–	
BurstMatching	MATC | NMAT | INV | OUT	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the tolerances for the effective burst and leakage power (see command above) have been exceeded (the *BurstMatching* parameter combines the two preceding values).		1.00

The following messages may be output for the values *LeakPowRMS and BurstPwCurrRMS:*

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CALCulate[:SCALar]:POWer[:SBURst][:DQPSk][:RESult]:MATChing:RAMP? Limit Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
BurstMatchCurr,	For all values:	INV	–	
BurstMatchMin,		INV	–	
BurstMatchMax,	MATC | NMAT | INV | OUT	INV	–	
BurstMatchAvg		INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the tolerances for the scalar measured values (see command above) have been exceeded.		1.00

The following messages may be output for the value *BurstMatching*:

MATC	*matching*
NMAT	*not matching*
INV	*invalid*
OUT	*out of range*

READ:ARRay:POWer[:SBURst][:DQPSk]:CURRent[:RESult]? Burst Power
READ:ARRay:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?
READ:ARRay:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?
READ:ARRay:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?
Start single shot measurement and return results RUN

FETCh:ARRay:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?
FETCh:ARRay:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?
FETCh:ARRay:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?
FETCh:ARRay:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?
Read meas. results (unsynchronized) RUN

SAMPle:ARRay:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?
SAMPle:ARRay:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?
SAMPle:ARRay:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?
SAMPle:ARRay:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?
Read results (synchronized) RUN

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 dB... + 20.0 dB,	BurstPower[1], 1st value for burst power	NAN	dB	
...	...	...	...	
–100.0 dB... + 20.0 dB	BurstPower[x], xth value for burst power	NAN	dB	

Description of command	Sig. State	FW vers.
These commands are always queries. They output the burst power versus time at fixed, equidistant test points. The number of measured values is 182 (oversampling factor 1) or 1456 (oversampling factor 8; see command `CONFigure:POWer[:SBURst][:DQPSk]:TIME:OVERsampling` *`<Factor>`*). The calculation of results in the modes *current, average, maximum* and *minimum* is explained in chapter 3 (see *display modes*).	all	1.00

READ:SUBarrays:POWer[:SBURst][:DQPSk]:CURRent[:RESult]? Subarray Results
READ:SUBarrays:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?
READ:SUBarrays:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?
READ:SUBarrays:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?
Start single shot measurement and return results RUN
FETCh:SUBarrays:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?
FETCh:SUBarrays:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?
FETCh:SUBarrays:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?
FETCh:SUBarrays:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?
Read meas. results (unsynchronized) RUN
SAMPle:SUBarrays:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?
SAMPle:SUBarrays:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?
SAMPle:SUBarrays:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?
SAMPle:SUBarrays:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?
Read results (synchronized) RUN

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 dB... + 20.0 dB	BurstPower[1], 1st value for burst power	NAN	dB	
...	...	...	...	
–100.0 dB... + 20.0 dB	BurstPower[x], xth value for burst power	NAN	dB	

Description of command	Sig. State	FW vers.
These commands are always queries. They output the burst power versus time in the subranges defined by means of the `CONFigure:SUBarrays:POWer` command. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above. The `CONFigure:SUBarrays:POWer` command defines a maximum of 32 subranges. If one of the statistical modes (`ARIThmetical`, `MINimum`, `MAXimum`) is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in chapter 3 (see *display mode*).	all	1.00

CALCulate:ARRay:POWer[:SBURst][:DQPSk]:CURRent[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?
CALCulate:ARRay:POWer[:SBURst][:DQPSk]:AVERage[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?
CALCulate:ARRay:POWer[:SBURst][:DQPSk]:MINimum[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?
CALCulate:ARRay:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?
Burst Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
32-bit field,	Indicator for upper limit matching in area 1 to 5	NAN	–	
32-bit field	Indicator for lower limit matching in area 1 to 5	NAN	–	

Description of command	Sig. State	FW vers.
This command is always a query. Any set bit of the two returned bit fields indicates that the corresponding section of the limit lines is violated.	all	1.00

List of Commands

In the following, all remote-control commands of the function groups IS 136 800/1900-MS are listed with their parameters and page numbers. They are arranged alphabetically according to the **second** keyword of the command so that related commands belong to the same group. The commands for the two test modes *Non Signalling* and *Signalling* are listed separately.

Commands for IS 136 800/1900-MS Measurements without Signalling

Table 6-1 Remote-control commands: Non Signalling

Command	Parameter	Remark	Page
Inputs and outputs			
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +50 dB	with query	6.8
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +50 dB	with query	6.8
[SENSe:]CORRection:LOSS:Output<nr>[:MAGNitude]	–50 dB to 50 dB	with query	6.8
SOURce:CORRection:LOSS:Output<nr>[:MAGNitude]	–50 dB to 50 dB	with query	6.8
SOURce:DM:CLOCk:FREQuency	1.219 MHz to 39.000 MHz	with query	6.8
SOURce:DM:CLOCk:STATe	ON | OFF	with query	6.8
INPut[:STATe]	RF1 | RF2 | RF4	with query	6.7
OUTPut[:STATe]	RF1 | RF2 | RF3	with query	6.7
RF Input Level			
[SENSe:]LEVel:ATTenuation	NORMal | LNOise | LDIStortion	with query	6.2
[SENSe:]LEVel:DEFault	ON | OFF	with query	6.2
[SENSe:]LEVel:MAXimum	<Level>	with query	6.2
[SENSe:]LEVel:MODE	MANual | AUTO	with query	6.1
Modulation Measurements			
INITiate:MODulation:EVMagnitude[:DQPSk]	–	no query	6.26
ABORt:MODulation:EVMagnitude[:DQPSk]	–	no query	6.26
STOP:MODulation:EVMagnitude[:DQPSk]	–	no query	6.26
CONTinue:MODulation:EVMagnitude[:DQPSk]	–	no query	6.26
CONFigure:SUBarrays:MODulation:EVMagnitude[:DQPSk]	ALL | ARIThmetical | MINimum | MAXimum, <Start>, <Samples> {,<Start>,<Samples>}	with query	6.29
READ:ARRAy:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
FETCh:ARRAy:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
SAMPle:ARRAy:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
READ:SUBarrays:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
FETCh:SUBarrays:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.27

Command	Parameter	Remark	Page
CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.28
DISPlay:MODulation:EVMagnitude[:DQPSk]:CONTrol:GRID	ON | OFF	with query	6.28
CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.27
READ:ARRAy:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
FETCh:ARRAy:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
SAMPle:ARRAy:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
READ:SUBarrays:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
FETCh:SUBarrays:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
CONFigure:MODulation:EVMagnitude[:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.26
READ:ARRAy:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
FETCh:ARRAy:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
SAMPle:ARRAy:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
READ:SUBarrays:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
FETCh:SUBarrays:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
FETCh:MODulation:EVMagnitude[:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.26
READ[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.30
FETCh[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.30
SAMPle[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.30
CALCulate[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]: MATChing:LIMit:FTSYmbols?	<Result>	query only	6.31
CALCulate[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]: MATChing:LIMit[:WBURst]?	<Result>	query only	6.31
READ[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.30
FETCh[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.30
SAMPle[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.30
INITiate:MODulation:MERRor[:DQPSk]	–	no query	6.40
ABORt:MODulation:MERRor[:DQPSk]	–	no query	6.40
STOP:MODulation:MERRor[:DQPSk]	–	no query	6.40
CONTinue:MODulation:MERRor[:DQPSk]	–	no query	6.40
CONFigure:SUBarrays:MODulation:MERRor[:DQPSk]	ALL | ARIThmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.42
READ:ARRAy:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
FETCh:ARRAy:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
SAMPle:ARRAy:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
READ:SUBarrays:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
FETCh:SUBarrays:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
CONFigure:MODulation:MERRor[:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.41
CONFigure:MODulation:MERRor[:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.42
DISPlay:MODulation:MERRor[:DQPSk]:CONTrol:GRID	ON | OFF	with query	6.41

Command	Parameter	Remark	Page
CONFigure:MODulation:MERRor[:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.41
READ:ARRAy:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
FETCh:ARRAy:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
SAMPle:ARRAy:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
READ:SUBarrays:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
FETCh:SUBarrays:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
CONFigure:MODulation:MERRor[:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.40
READ:ARRAy:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
FETCh:ARRAy:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
SAMPle:ARRAy:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
READ:SUBarrays:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
FETCh:SUBarrays:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
FETCh:MODulation:MERRor[:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.40
READ[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.43
FETCh[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.43
SAMPle[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.43
CALCulate[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?	<Result>	query only	6.44
CALCulate[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?	<Result>	query only	6.44
READ[:SCALar]:MODulation:MERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.43
FETCh[:SCALar]:MODulation:MERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.43
SAMPle[:SCALar]:MODulation:MERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.43
CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit:FTSYmbols	<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>	with query	6.23
CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit[:WBURst	<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>	with query	6.22
CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit:FTSYmbols	<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>	with query	6.22

Command	Parameter	Remark	Page
CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit[:WBURst	<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>	with query	6.21
CONFigure:MODulation:OEMP[:DQPSk]:LIMit:DEFault	ON | OFF	with query	6.23
INITiate:MODulation:PERRor[:DQPSk]	–	no query	6.33
ABORt:MODulation:PERRor[:DQPSk]	–	no query	6.33
STOP:MODulation:PERRor[:DQPSk]	–	no query	6.33
CONTinue:MODulation:PERRor[:DQPSk]	–	no query	6.33
CONFigure:SUBarrays:MODulation:PERRor[:DQPSk]	ALL | ARIThmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.36
READ:ARRAy:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
FETCh:ARRAy:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
SAMPle:ARRAy:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
READ:SUBarrays:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
FETCh:SUBarrays:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
CONFigure:MODulation:PERRor[:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.34
CONFigure:MODulation:PERRor[:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.35
DISPlay:MODulation:PERRor[:DQPSk]:CONTrol:GRID	ON | OFF	with query	6.35
CONFigure:MODulation:PERRor[:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.34
READ:ARRAy:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
FETCh:ARRAy:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
SAMPle:ARRAy:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
READ:SUBarrays:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
FETCh:SUBarrays:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
CONFigure:MODulation:PERRor[:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.33
READ:ARRAy:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
FETCh:ARRAy:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
SAMPle:ARRAy:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
READ:SUBarrays:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
FETCh:SUBarrays:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
FETCh:MODulation:PERRor[:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.33
READ[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.37
FETCh[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.37
SAMPle[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.37

Command	Parameter	Remark	Page
CALCulate[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?	<Result>	query only	6.38
CALCulate[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?	<Result>	query only	6.38
READ[:SCALar]:MODulation:PERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.37
FETCh[:SCALar]:MODulation:PERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.37
SAMPle[:SCALar]:MODulation:PERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.37
INITiate:MODulation[:OVERview][:DQPSk]	–	no query	6.19
ABORt:MODulation[:OVERview][:DQPSk]	–	no query	6.19
STOP:MODulation[:OVERview][:DQPSk]	–	no query	6.19
CONTinue:MODulation[:OVERview][:DQPSk]	–	no query	6.19
CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.20
CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.21
CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.20
CONFigure:MODulation[:OVERview][:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.19
FETCh:MODulation[:OVERview][:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.19
READ[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.24
FETCh[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.24
SAMPle[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.24
CALCulate[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?	<Result>	query only	6.25
CALCulate[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?	<Result>	query only	6.25
READ[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.24
FETCh[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.24
SAMPle[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.24
Power Measurements			
INITiate:POWer[:NBURst][:DQPSk]	–	no query	6.9
ABORt:POWer[:NBURst][:DQPSk]	–	no query	6.9
STOP:POWer[:NBURst][:DQPSk]	–	no query	6.9
CONTinue:POWer[:NBURst][:DQPSk]	–	no query	6.9
CONFigure:SUBarrays:POWer[:NBURst][:DQPSk]	ALL | ARITHmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.14
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:AVERage[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.18
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:AVERage[:RESult]:MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.16
READ:ARRAy:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
SAMPle:ARRAy:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
READ:SUBarrays:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18

Command	Parameter	Remark	Page
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.10
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.11
DISPlay:POWer[:NBURst][:DQPSk]:CONTrol:GRID	ON | OFF	with query	6.11
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE,STEP | NONE	with query	6.11
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.18
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:CURRent[:RESult]:MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.16
READ:ARRAy:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
SAMPle:ARRAy:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
READ:SUBarrays:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
CONFigure:POWer[:NBURst][:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.9
CONFigure:POWer[:NBURst][:DQPSk]:LIMit:DEFault	ON | OFF	with query	6.13
CONFigure:POWer[:NBURst][:DQPSk]:LIMit:POINt[:ASYMmetrical]:LPOWer	–80 dBm to 0 dBm	with query	6.13
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer	<LevelRel>, <EnableArea>	with query	6.12
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer:ENABle	ON | OFF	with query	6.12
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:UPPer:AREA<nr>:ENABle	ON | OFF	with query	6.12
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:UPPer:AREA<nr>	<LevelRel>, <EnableArea>	with query	6.12
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.18
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]:MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.16
READ:ARRAy:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
SAMPle:ARRAy:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
READ:SUBarrays:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:MINimum[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.18
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:MINimum[:RESult]:MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.16
READ:ARRAy:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
SAMPle:ARRAy:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
READ:SUBarrays:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18

Command	Parameter	Remark	Page
FETCh:POWer[:NBURst][:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.10
CONFigure:POWer[:NBURst][:DQPSk]:TIME:OVERsampling	1 | 8	with query	6.13
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]:MATChing:RAMP?	BurstMatching	query only	6.16
READ[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?	<Result>	query only	6.15
FETCh[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?	<Result>	query only	6.15
SAMPle[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?	AvgBurstPower, PeakBurstPower, BurstsOutOfTol, BurstMatching	query only	6.15
RF Generator and Analyzer Settings			
[SENSe:]RFANalyzer:EMSSync	OFF | IS1 to IS6 | ALL	with query	6.5
[SENSe:]RFANalyzer:FREQuency	0.2 MHz to 2,700 MHz	with query	6.4
[SENSe:]RFANalyzer:FREQuency:OFFSet	–15 kHz to 15 kHz	with query	6.4
[SENSe:]RFANalyzer:FREQuency:UNIT	Hz | KHZ | MHZ | GHZ | CH	with query	6.4
INITiate:RFGenerator	–	no query	6.5
ABORt:RFGenerator	–	no query	6.5
SOURce:RFGenerator:FREQuency	0.2 MHz to 2700 MHz	with query	6.6
SOURce:RFGenerator:FREQuency:OFFSet	–15 kHz to 15 kHz	with query	6.6
SOURce:RFGenerator:FREQuency:UNIT	Hz | KHZ | MHZ | GHZ | CH	with query	6.6
SOURce:RFGenerator:LEVel	<Level>	with query	6.5
CONFigure:RFGenerator:MODulation:RFS:TYPE	OFF |PRBS |DUMMybursts	with query	6.7
FETCh:RFGenerator:STATus?	OFF | RUN | ERR	query only	6.5
RX Quality Measurement			
INITiate:RXQuality:BER	–	no query	6.54
ABORt:RXQuality:BER	–	no query	6.54
STOP:RXQuality:BER	–	no query	6.54
CONTinue:RXQuality:BER	–	no query	6.54
CONFigure:RXQuality:BER:CONTrol:TSETup1:FRAMes	1 to 500 | NONE	with query	6.55
CONFigure:RXQuality:BER:CONTrolTSETup1[:DTC]:LEVel	<Level>	with query	6.55
CONFigure:RXQuality:BER:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.54
CONFigure:RXQuality:BER:LIMit:TSETup<nr>:ABITs	0 % to 100 %	with query	6.55
FETCh:RXQuality:BER:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 50000 | NONE	query only	6.54
CALCulate[:SCALar]:RXQuality:BER[:RESult]:MATChing?	<Result>	query only	6.56
READ[:SCALar]:RXQuality:BER[:RESult]?	<Result>	query only	6.56
FETCh[:SCALar]:RXQuality:BER[:RESult]?	<Result>	query only	6.56
SAMPle[:SCALar]:RXQuality:BER[:RESult]?	<Result>	query only	6.56
Spectrum Measurement			
INITiate:SPECtrum[:ACPower]	–	no query	6.46
ABORt:SPECtrum[:ACPower]	–	no query	6.46
STOP:SPECtrum[:ACPower]	–	no query	6.46
CONTinue:SPECtrum[:ACPower]	–	no query	6.46

Command	Parameter	Remark	Page
CONFigure:SPECtrum[:ACPower]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.47
CONFigure:SPECtrum[:ACPower]:CONTrol:ACHannel	-3 to –1 | +1 to +3	with query	6.48
CONFigure:SPECtrum[:ACPower]:CONTrol:DEFault	ON | OFF	with query	6.48
DISPlay:SPECtrum[:ACPower]:CONTrol:GRID	ON | OFF	with query	6.48
CONFigure:SPECtrum[:ACPower]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.47
CONFigure:SPECtrum[:ACPower]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.46
CONFigure:SPECtrum[:ACPower]:LIMit:CHN<nr>	<LevelPeak>, <LevelRMS>, ON | OFF	with query	6.49
CONFigure:SPECtrum[:ACPower]:LIMit:CHN<nr>:ENABle	ON | OFF	with query	6.49
CONFigure:SPECtrum[:ACPower]:LIMit:CHP<nr>	<LevelPeak>, <LevelRMS>, ON | OFF	with query	6.49
CONFigure:SPECtrum[:ACPower]:LIMit:CHP<nr>:MODE	ON | OFF	with query	6.49
CONFigure:SPECtrum[:ACPower]:LIMit:DEFault	ON | OFF	with query	6.50
FETCh:SPECtrum[:ACPower]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.46
READ:ARRAy:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
FETCh:ARRAy:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
SAMPle:ARRAy:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
READ:ARRAy:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
FETCh:ARRAy:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
SAMPle:ARRAy:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
READ:ARRAy:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
FETCh:ARRAy:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
SAMPle:ARRAy:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
READ:ARRAy:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
FETCh:ARRAy:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
SAMPle:ARRAy:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
CONFigure:SUBarrays:SPECtrum[:ACPower]:TDOMain[:DQPSk]	ALL | ARITHmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.50
CALCulate[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]:MATChing:LIMit?	<Result>	query only	6.52

Command	Parameter	Remark	Page
READ[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?	–100 dBm to 50 dBm, INV | MATC | NMAT | OUT | NTR | BNF | OFF	query only	6.51
FETCh[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?	–100 dBm to 50 dBm, INV | MATC | NMAT | OUT | NTR | BNF | OFF	query only	6.51
SAMPle[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?	–100 dBm to 50 dBm, INV | MATC | NMAT | OUT | NTR | BNF | OFF	query only	6.51
Trigger			
TRIGger[:SEQuence]:DEFault	ON | OFF	with query	6.3
TRIGger[:SEQuence]:SOURce	IMMediate | RFPower | IFPower | EXTern	with query	6.2
TRIGger[:SEQuence]:THReshold	LOW | MEDium | HIGH	with query	6.3

Commands for IS 136 800/1900-MS Measurements with Signalling

Table 6-2 Remote-control commands: Signalling mode

Command	Parameter	Remark	Page
RF Signals of the CMU (Base Station)			
CONFigure:BSSignal:DCCH:CHANnel	<Channel>	with query	6.62
CONFigure:BSSignal:DCCH:LEVel	<Level>	with query	6.63
CONFigure:BSSignal:OCHandoff[:DTC]:CHANnel	<DTCChannel>	with query	6.64
CONFigure:BSSignal:OCHandoff[:DTC]:LEVel	<Level>	with query	6.65
CONFigure:BSSignal:SPEech	ECHO | LOOP	with query	6.64
PROCedure:BSSignal:SPEech	ECHO | LOOP	with query	6.64
CONFigure:BSSignal:VCODer	VSELp | ACELp | MSELected	with query	6.64
CONFigure:BSSignal[:DTC]:CHANnel	<DTCChannel>	with query	6.63
CONFigure:BSSignal[:DTC]:LEVel	<Level>	with query	6.63
PROCedure:BSSignal[:DTC]:LEVel	<Level>	with query	6.63
CONFigure:BSSignal[:DTC]:SLOTconfig	C14 | C25 | C36	with query	6.63
CONFigure:BSSignalOCHandoff[:DTC]:SLOTconfig	C14 | C25 | C36	with query	6.64
Channel Unit			
UNIT:CHANnel	CH | HZ | KHZ | MHZ | GHZ	with query	6.57
Inputs and Outputs			
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +50 dB	with query	6.73
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +50 dB	with query	6.73
[SENSe:]CORRection:LOSS:Output<nr>[:MAGNitude]	–50 dB to 50 dB	with query	6.73
SOURce:CORRection:LOSS:Output<nr>[:MAGNitude]	–50 dB to 50 dB	with query	6.73
SOURce:DM:CLOCk:FREQuency	1.219 MHz to 39.000 MHz	with query	6.73
SOURce:DM:CLOCk:STATe	ON | OFF	with query	6.73
INPut[:STATe]	RF1 | RF2 | RF4	with query	6.72
OUTPut[:STATe]	RF1 | RF2 | RF3	with query	6.72
Handoff Target			
CONFigure:HANDoff:TARGet	<Target>	with query	6.62
STATus:HANDoff:TARGet:LIST?	<List>	query only	6.62
RF Input Level			
[SENSe:]LEVel:ATTenuation	NORMal | LNOise | LDIStortion	with query	6.58
[SENSe:]LEVel:DEFault	ON | OFF	with query	6.58
[SENSe:]LEVel:MAXimum	<Level>	with query	6.58
[SENSe:]LEVel:MODE	MANual | PCLevel | AUTO	with query	6.57
Modulation Measurements			
INITiate:MODulation:EVMagnitude[:DQPSk]	–	no query	6.26
ABORt:MODulation:EVMagnitude[:DQPSk]	–	no query	6.26

Command	Parameter	Remark	Page
STOP:MODulation:EVMagnitude[:DQPSk]	–	no query	6.26
CONTinue:MODulation:EVMagnitude[:DQPSk]	–	no query	6.26
CONFigure:SUBarrays:MODulation:EVMagnitude[:DQPSk]	ALL | ARIThmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.29
READ:ARRAy:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
FETCh:ARRAy:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
SAMPle:ARRAy:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
READ:SUBarrays:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
FETCh:SUBarrays:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.27
CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.28
DISPlay:MODulation:EVMagnitude[:DQPSk]:CONTrol:GRID	ON | OFF	with query	6.28
CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.27
READ:ARRAy:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
FETCh:ARRAy:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
SAMPle:ARRAy:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
READ:SUBarrays:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
FETCh:SUBarrays:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
CONFigure:MODulation:EVMagnitude[:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.26
READ:ARRAy:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
FETCh:ARRAy:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
SAMPle:ARRAy:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.31
READ:SUBarrays:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
FETCh:SUBarrays:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
SAMPle:SUBarrays:MODulation:EVMagnitude[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.32
FETCh:MODulation:EVMagnitude[:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.26
READ[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.30
FETCh[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.30
SAMPle[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.30
CALCulate[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]: MATChing:LIMit:FTSYmbols?	<Result>	query only	6.31
CALCulate[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]: MATChing:LIMit[:WBURst]?	<Result>	query only	6.31
READ[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.30
FETCh[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.30
SAMPle[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.30
INITiate:MODulation:MERRor[:DQPSk]	–	no query	6.40
ABORt:MODulation:MERRor[:DQPSk]	–	no query	6.40
STOP:MODulation:MERRor[:DQPSk]	–	no query	6.40
CONTinue:MODulation:MERRor[:DQPSk]	–	no query	6.40

Command	Parameter	Remark	Page
CONFigure:SUBarrays:MODulation:MERRor[:DQPSk]	ALL | ARIThmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.42
READ:ARRAy:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
FETCh:ARRAy:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
SAMPle:ARRAy:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
READ:SUBarrays:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
FETCh:SUBarrays:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
CONFigure:MODulation:MERRor[:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.41
CONFigure:MODulation:MERRor[:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.42
DISPlay:MODulation:MERRor[:DQPSk]:CONTrol:GRID	ON | OFF	with query	6.41
CONFigure:MODulation:MERRor[:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.41
READ:ARRAy:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
FETCh:ARRAy:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
SAMPle:ARRAy:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
READ:SUBarrays:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
FETCh:SUBarrays:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
CONFigure:MODulation:MERRor[:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.40
READ:ARRAy:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
FETCh:ARRAy:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
SAMPle:ARRAy:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.44
READ:SUBarrays:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
FETCh:SUBarrays:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
SAMPle:SUBarrays:MODulation:MERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.45
FETCh:MODulation:MERRor[:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.40
READ[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.43
FETCh[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.43
SAMPle[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.43
CALCulate[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:MATChing: LIMit:FTSYmbols?	<Result>	query only	6.44
CALCulate[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:MATChing LIMit[:WBURst]?	<Result>	query only	6.44
READ[:SCALar]:MODulation:MERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.43
FETCh[:SCALar]:MODulation:MERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.43
SAMPle[:SCALar]:MODulation:MERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.43
CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit:FTSYmbols	<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>	with query	6.23

Command	Parameter	Remark	Page
CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit[:WBURst	<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>	with query	6.22
CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit:FTSYmbols	<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>	with query	6.22
CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit[:WBURst	<PhaseErrorPeak>, <PhaseErrorRMS>, <MagnErrorPeak>, <MagnErrorRMS>, <EVMErrorPeak>, <EVMErrorRMS>, <OriginOffset>, <IQImbalance>, <FreqError>	with query	6.21
CONFigure:MODulation:OEMP[:DQPSk]:LIMit:DEFault	ON | OFF	with query	6.23
INITiate:MODulation:PERRor[:DQPSk]	–	no query	6.33
ABORt:MODulation:PERRor[:DQPSk]	–	no query	6.33
STOP:MODulation:PERRor[:DQPSk]	–	no query	6.33
CONTinue:MODulation:PERRor[:DQPSk]	–	no query	6.33
CONFigure:SUBarrays:MODulation:PERRor[:DQPSk]	ALL | ARIThmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.36
READ:ARRAy:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
FETCh:ARRAy:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
SAMPle:ARRAy:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
READ:SUBarrays:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
FETCh:SUBarrays:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
CONFigure:MODulation:PERRor[:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.34
CONFigure:MODulation:PERRor[:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.35
DISPlay:MODulation:PERRor[:DQPSk]:CONTrol:GRID	ON | OFF	with query	6.35
CONFigure:MODulation:PERRor[:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.34
READ:ARRAy:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
FETCh:ARRAy:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
SAMPle:ARRAy:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
READ:SUBarrays:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
FETCh:SUBarrays:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
CONFigure:MODulation:PERRor[:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.33

Command	Parameter	Remark	Page
READ:ARRAy:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
FETCh:ARRAy:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
SAMPle:ARRAy:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +100.0 dB	query only	6.38
READ:SUBarrays:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
FETCh:SUBarrays:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
SAMPle:SUBarrays:MODulation:PERRor[:DQPSk]:MMAX[:RESult]?	–100.0 dB to +20.0 dB	query only	6.39
FETCh:MODulation:PERRor[:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.33
READ[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.37
FETCh[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.37
SAMPle[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.37
CALCulate[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?	<Result>	query only	6.38
CALCulate[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?	<Result>	query only	6.38
READ[:SCALar]:MODulation:PERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.37
FETCh[:SCALar]:MODulation:PERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.37
SAMPle[:SCALar]:MODulation:PERRor[:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.37
INITiate:MODulation[:OVERview][:DQPSk]	–	no query	6.19
ABORt:MODulation[:OVERview][:DQPSk]	–	no query	6.19
STOP:MODulation[:OVERview][:DQPSk]	–	no query	6.19
CONTinue:MODulation[:OVERview][:DQPSk]	–	no query	6.19
CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.20
CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.21
CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.20
CONFigure:MODulation[:OVERview][:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.19
FETCh:MODulation[:OVERview][:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.19
READ[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.24
FETCh[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.24
SAMPle[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:FTSYmbols?	<Result>	query only	6.24
CALCulate[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?	<Result>	query only	6.25
CALCulate[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?	<Result>	query only	6.25
READ[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.24
FETCh[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.24
SAMPle[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult][:WBURst]?	<Result>	query only	6.24
Mobile Info			
[SENSe:]MSSinfo:BANDwidth?	<numeric_value>	query only	6.75
[SENSe:]MSSinfo:DNUMber?	<numeric_value>	query only	6.75
[SENSe:]MSSinfo:DTX?	<numeric_value>	query only	6.75
[SENSe:]MSSinfo:ESN?	<numeric_value>	query only	6.74

Command	Parameter	Remark	Page
[SENSe:]MSSinfo:MSID:NUMBer?	<numeric_value>	query only	6.74
[SENSe:]MSSinfo:MSID:TYPE?	ID20 | IDD24 | MIN | IMSI	query only	6.74
[SENSe:]MSSinfo:PCLass?	<numeric_value>	query only	6.74
[SENSe:]MSSinfo:PVERsion?	PV0 | PV1 | PV2 | PV3 | PV4 | PV5	query only	6.75
[SENSe:]MSSinfo:VCODer?	<numeric_value>	query only	6.75
Network Parameters			
CONFigure:NETWork:IDENtity:MCC	0 to 1023	with query	6.65
CONFigure:NETWork:IDENtity:SID	0 to 32767	with query	6.65
CONFigure:NETWork:NCDef	<Channel>{, <Channel>}	with query	6.71
CONFigure:NETWork:NCDef:CELL<nr>	<Channel>	with query	6.71
CONFigure:NETWork:OCHandoff[:MS]:DTCMAC	0 to 10	with query	6.72
CONFigure:NETWork:REQuest:Capability	ON | OFF	with query	6.68
CONFigure:NETWork:REQuest:SNUMber	ON | OFF	with query	6.68
CONFigure:NETWork:SMODe:DEReg	ON | OFF	with query	6.66
CONFigure:NETWork:SMODe:ID<nr>	0 to 1048575 | 0 to 16777215	with query	6.67
CONFigure:NETWork:SMODe:IDIMsi	0 to $2^{50} - 1$	with query	6.67
CONFigure:NETWork:SMODe:IDMin	0 to $2^{34} - 1$	with query	6.67
CONFigure:NETWork:SMODe:IDType	ON | OFF	with query	6.67
CONFigure:NETWork:SMODe:PDReg	ON | OFF	with query	6.66
CONFigure:NETWork:SMODe:PUReg	ON | OFF	with query	6.66
CONFigure:NETWork:SMODe:PUReg	ON | OFF	with query	6.66
CONFigure:NETWork:SYSTem:CCSDvcc	0 to 255	with query	6.70
CONFigure:NETWork:SYSTem:NOESlots	5 to 10	with query	6.70
CONFigure:NETWork:SYSTem:NOFSlots	5 to 10	with query	6.70
CONFigure:NETWork:TIMeout:LORLINk	4 to 64	with query	6.71
CONFigure:NETWork:TIMeout:RPERiod	0 s to 60 s | OFF	with query	6.71
CONFigure:NETWork[:MS]:DCCMac	0 to 7	with query	6.68
CONFigure:NETWork[:MS]:DELay	0 superframes to 420 superframes	with query	6.69
CONFigure:NETWork[:MS]:DIC	DCCH | DTC	with query	6.69
CONFigure:NETWork[:MS]:DTCMac	0 to 10	with query	6.69
CONFigure:NETWork[:MS]:RAMin	–8, –111 dBm to –51 dBm	with query	6.69
CONFigure:NETWork[:MS]:SBINdicator	NORMal | SHORtened	with query	6.70
CONFigure:NETWork[:MS]:SCANinterval	1 hyperframe to 16 hyperframes	with query	6.69
CONFigure:NETWork[:MS]:SUFF	–8, –111 dBm to –51 dBm	with query	6.68
Power Measurements			
INITiate:POWer[:NBURst][:DQPSk]	–	no query	6.9
ABORt:POWer[:NBURst][:DQPSk]	–	no query	6.9
STOP:POWer[:NBURst][:DQPSk]	–	no query	6.9
CONTinue:POWer[:NBURst][:DQPSk]	–	no query	6.9

Command	Parameter	Remark	Page
CONFigure:SUBarrays:POWer[:NBURst][:DQPSk]	ALL | ARITHmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.14
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:AVERage[:RESult]: MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.18
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:AVERage[:RESult]: MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.16
READ:ARRAy:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
SAMPle:ARRAy:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
READ:SUBarrays:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.10
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.11
DISPlay:POWer[:NBURst][:DQPSk]:CONTrol:GRID	ON | OFF	with query	6.11
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE,STEP | NONE	with query	6.11
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]: MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.18
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:CURRent[:RESult]: MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.16
READ:ARRAy:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
SAMPle:ARRAy:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
READ:SUBarrays:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
CONFigure:POWer[:NBURst][:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.9
CONFigure:POWer[:NBURst][:DQPSk]:LIMit:DEFault	ON | OFF	with query	6.13
CONFigure:POWer[:NBURst][:DQPSk]:LIMit:POINt[:ASYMmetrical]:LPOWer	–80 dBm to 0 dBm	with query	6.13
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer	<LevelRel>, <EnableArea>	with query	6.12
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer: ENABle	ON | OFF	with query	6.12
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:UPPer: AREA<nr>:ENABle	ON | OFF	with query	6.12
CONFigure:POWer[:NBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:UPPer: AREA<nr>	<LevelRel>, <EnableArea>	with query	6.12
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:MAXimum[:RESult] MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.18
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]: MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.16
READ:ARRAy:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
SAMPle:ARRAy:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
READ:SUBarrays:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18

Command	Parameter	Remark	Page
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:MINimum[:RESult]: MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.18
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:MINimum[:RESult]: MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.16
READ:ARRAy:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
FETCh:ARRAy:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
SAMPle:ARRAy:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.17
READ:SUBarrays:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
FETCh:SUBarrays:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
SAMPle:SUBarrays:POWer[:NBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.18
FETCh:POWer[:NBURst][:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.10
CONFigure:POWer[:NBURst][:DQPSk]:TIME:OVERsampling	1 | 8	with query	6.13
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]:MATChing:RAMP?	BurstMatching	query only	6.16
READ[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?	<Result>	query only	6.15
FETCh[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?	<Result>	query only	6.15
SAMPle[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]?	AvgBurstPower, PeakBurstPower, BurstsOutOfTol, BurstMatching	query only	6.15
INITiate:POWer[:SBURst][:DQPSk]	–	no query	6.79
ABORt:POWer[:SBURst][:DQPSk]	–	no query	6.79
STOP:POWer[:SBURst][:DQPSk]	–	no query	6.79
CONTinue:POWer[:SBURst][:DQPSk]	–	no query	6.79
CONFigure:SUBarrays:POWer[:SBURst][:DQPSk]	ALL | ARITHmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.83
CALCulate:ARRay:POWer[:SBURst][:DQPSk]:AVERage[:RESult]: MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.87
CALCulate[:SCALar]:POWer[:SBURst][:DQPSk]:AVERage[:RESult]: MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.85
READ:ARRAy:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
FETCh:ARRAy:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
SAMPle:ARRAy:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
READ:SUBarrays:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
FETCh:SUBarrays:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
SAMPle:SUBarrays:POWer[:SBURst][:DQPSk]:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
CONFigure:POWer[:SBURst][:DQPSk]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.80
CONFigure:POWer[:SBURst][:DQPSk]:CONTrol:DEFault	ON | OFF	with query	6.81
DISPlay:POWer[:SBURst][:DQPSk]:CONTrol:GRID	ON | OFF	with query	6.80
CONFigure:POWer[:SBURst][:DQPSk]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE,STEP | NONE	with query	6.80
CALCulate:ARRay:POWer[:SBURst][:DQPSk]:CURRent[:RESult]: MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.87
CALCulate[:SCALar]:POWer[:SBURst][:DQPSk]:CURRent[:RESult]: MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.85
READ:ARRAy:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86

Command	Parameter	Remark	Page
FETCh:ARRAy:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
SAMPle:ARRAy:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
READ:SUBarrays:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
FETCh:SUBarrays:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
SAMPle:SUBarrays:POWer[:SBURst][:DQPSk]:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
CONFigure:POWer[:SBURst][:DQPSk]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.79
CONFigure:POWer[:SBURst][:DQPSk]:LIMit:DEFault	ON | OFF	with query	6.82
CONFigure:POWer[:SBURst][:DQPSk]:LIMit:POINt[:ASYMmetrical]:LPOWer	–80 dBm to 0 dBm	with query	6.82
CONFigure:POWer[:SBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer	<LevelRel>, <EnableArea>	with query	6.82
CONFigure:POWer[:SBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:LOWer:ENABle	ON | OFF	with query	6.82
CONFigure:POWer[:SBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:UPPer:AREA<nr>	<LevelRel>, <EnableArea>	with query	6.81
CONFigure:POWer[:SBURst][:DQPSk]:LIMit[:LINE][:ASYMmetrical]:UPPer:AREA<nr>:ENABle	ON | OFF	with query	6.81
CALCulate:ARRay:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.87
CALCulate[:SCALar]:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]:MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.85
READ:ARRAy:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
FETCh:ARRAy:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
SAMPle:ARRAy:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
READ:SUBarrays:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
FETCh:SUBarrays:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
SAMPle:SUBarrays:POWer[:SBURst][:DQPSk]:MAXimum[:RESult]?	–100.0 dB dB to +20.0 dB	query only	6.87
CALCulate:ARRay:POWer[:SBURst][:DQPSk]:MINimum[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	32-bit field, 32-bit field	query only	6.87
CALCulate[:SCALar]:POWer[:SBURst][:DQPSk]:MINimum[:RESult]:MATChing?	BurstPwCurrRMS, LeakPowRMS	query only	6.85
READ:ARRAy:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
FETCh:ARRAy:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
SAMPle:ARRAy:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.86
READ:SUBarrays:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
FETCh:SUBarrays:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
SAMPle:SUBarrays:POWer[:SBURst][:DQPSk]:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.87
FETCh:POWer[:SBURst][:DQPSk]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.79
CONFigure:POWer[:SBURst][:DQPSk]:TIME:OVERsampling	1 | 8	with query	6.82
CALCulate[:SCALar]:POWer[:SBURst][:DQPSk][:RESult]:MATChing:RAMP?	BurstMatching	query only	6.85
READ[:SCALar]:POWer[:SBURst][:DQPSk][:RESult]?	<Result>	query only	6.84
FETCh[:SCALar]:POWer[:SBURst][:DQPSk][:RESult]?	<Result>	query only	6.84
SAMPle[:SCALar]:POWer[:SBURst][:DQPSk][:RESult]?	AvgBurstPower, PeakBurstPower, BurstsOutOfTol, BurstMatching	query only	6.84
RX Quality Measurement			
[SENSe:]RXQuality:MAHO:CQUality:BER?	0% to 100%	query only	6.78
[SENSe:]RXQuality:MAHO:CQUality:RSSI?	0% to 100%	query only	6.78

Command	Parameter	Remark	Page
[SENSe:]RXQuality:MAHO:NCELls:CELL<nr>?	<Channel>, <RSSI>	query only	6.78
[SENSe:]RXQuality:MAHO:NCELls?	<Channel_1>, <RSSI_1>, ..., <Channel_24>, <RSSI_24>	query only	6.78
Signalling			
PROCedure:SIGNalling:ACTion	SOFF | SON | MTC | SMS | CRELease | HANDoff	with query	6.60
[SENSe:]SIGNalling:STATe?	SOFF | SON | REG | CEST | CPEN | CED	query only	6.61
PROCedure:SIGNalling[:DTC]:CHANnel	<Number>	with query	6.61
PROCedure:SIGNalling[:DTC]:MAC	0 to 10	with query	6.61
PROCedure:SIGNalling[:DTC]:SLOTconfig	2 to 6	with query	6.61
Spectrum Measurement			
INITiate:SPECtrum[:ACPower]	–	no query	6.46
ABORt:SPECtrum[:ACPower]	–	no query	6.46
STOP:SPECtrum[:ACPower]	–	no query	6.46
CONTinue:SPECtrum[:ACPower]	–	no query	6.46
CONFigure:SPECtrum[:ACPower]:CONTrol	SCALar | ARRay, 1 to 1000 | NONE	with query	6.47
CONFigure:SPECtrum[:ACPower]:CONTrol:ACHannel	-3 to –1 | +1 to +3	with query	6.48
CONFigure:SPECtrum[:ACPower]:CONTrol:DEFault	ON | OFF	with query	6.48
DISPlay:SPECtrum[:ACPower]:CONTrol:GRID	ON | OFF	with query	6.48
CONFigure:SPECtrum[:ACPower]:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.47
CONFigure:SPECtrum[:ACPower]:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.46
CONFigure:SPECtrum[:ACPower]:LIMit:CHN<nr>	<LevelPeak>, <LevelRMS>, ON | OFF	with query	6.49
CONFigure:SPECtrum[:ACPower]:LIMit:CHN<nr>:ENABle	ON | OFF	with query	6.49
CONFigure:SPECtrum[:ACPower]:LIMit:CHP<nr>	<LevelPeak>, <LevelRMS>, ON | OFF	with query	6.49
CONFigure:SPECtrum[:ACPower]:LIMit:CHP<nr>:MODE	ON | OFF	with query	6.49
CONFigure:SPECtrum[:ACPower]:LIMit:DEFault	ON | OFF	with query	6.50
FETCh:SPECtrum[:ACPower]:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.46
READ:ARRAy:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
FETCh:ARRAy:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
SAMPle:ARRAy:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:AVERage[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
READ:ARRAy:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
FETCh:ARRAy:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
SAMPle:ARRAy:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53

Command	Parameter	Remark	Page
SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:CURRent[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
READ:ARRAy:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
FETCh:ARRAy:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
SAMPle:ARRAy:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:MAXimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
READ:ARRAy:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
FETCh:ARRAy:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
SAMPle:ARRAy:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.52
READ:SUBarrays:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
FETCh:SUBarrays:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
SAMPle:SUBarrays:SPECtrum[:ACPower]:TDOMain:MINimum[:RESult]?	–100.0 dB to +20.0 dB	query only	6.53
CONFigure:SUBarrays:SPECtrum[:ACPower]:TDOMain[:DQPSk]	ALL | ARITHmetical | MINimum | MAXimum, <Start>,<Samples> {,<Start>,<Samples>}	with query	6.50
CALCulate[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]:MATChing: LIMit?	<Result>	query only	6.52
READ[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?	–100 dBm to 50 dBm, INV | MATC | NMAT | OUT | NTR | BNF | OFF	query only	6.51
FETCh[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?	–100 dBm to 50 dBm, INV | MATC | NMAT | OUT | NTR | BNF | OFF	query only	6.51
SAMPle[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]?	–100 dBm to 50 dBm, INV | MATC | NMAT | OUT | NTR | BNF | OFF	query only	6.51
Trigger			
TRIGger[:SEQuence]:DEFault	ON | OFF	with query	6.59
TRIGger[:SEQuence]:SOURce	SIGNalling | FRUN | RFPower | IFPower	with query	6.58
TRIGger[:SEQuence]:THReshold	LOW | MEDium | HIGH	with query	6.59
Wide-Band Power			
INITiate:WPOWer	–	no query	6.76
ABORt:WPOWer	–	no query	6.76
STOP:WPOWer	–	no query	6.76
CONTinue:WPOWer	–	no query	6.76
CONFigure:WPOWer:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE,STEP | NONE	with query	6.77
CONFigure:WPOWer:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.76
FETCh:WPOWer:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.76
READ[:SCALar]:WPOWer[:RESult]?	–30 dBm to 30 dBm	query only	6.77
FETCh[:SCALar]:WPOWer[:RESult]?	–30 dBm to 30 dBm	query only	6.77
SAMPle[:SCALar]:WPOWer[:RESult]?	–30 dBm to 30 dBm	query only	6.77

Alphabetical Command Lists

Table 6-3 Remote-control commands: *Non Signalling* mode

Command (Non Signalling, alphabetical)	**Page**
ABORt:MODulation:EVMagnitude[:DQPSk]	6.26
ABORt:MODulation:MERRor[:DQPSk]	6.40
ABORt:MODulation:PERRor[:DQPSk]	6.33
ABORt:MODulation[:OVERview][:DQPSk]	6.19
ABORt:POWer[:NBURst][:DQPSk]	6.9
ABORt:RFGenerator	6.5
ABORt:RXQuality:BER	6.54
ABORt:SPECtrum[:ACPower]	6.46
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:AVERage[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	6.18
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:CURRent[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	6.18
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	6.18
CALCulate:ARRay:POWer[:NBURst][:DQPSk]:MINimum[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	6.18
CALCulate[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?	6.31
CALCulate[:SCALar]:MODulation:EVMagnitude[:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?	6.31
CALCulate[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?	6.44
CALCulate[:SCALar]:MODulation:MERRor[:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?	6.44
CALCulate[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?	6.38
CALCulate[:SCALar]:MODulation:PERRor[:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?	6.38
CALCulate[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:MATChing:LIMit:FTSYmbols?	6.25
CALCulate[:SCALar]:MODulation[:OVERview][:DQPSk][:RESult]:MATChing:LIMit[:WBURst]?	6.25
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:AVERage[:RESult]:MATChing?	6.16
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:CURRent[:RESult]:MATChing?	6.16
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:MAXimum[:RESult]:MATChing?	6.16
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk]:MINimum[:RESult]:MATChing?	6.16
CALCulate[:SCALar]:POWer[:NBURst][:DQPSk][:RESult]:MATChing:RAMP?	6.16
CALCulate[:SCALar]:RXQuality:BER[:RESult]:MATChing?	6.56
CALCulate[:SCALar]:SPECtrum[:ACPower][:FDOMain][:RESult]:MATChing:LIMit?	6.52
CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol	6.27
CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol:DEFault	6.28
CONFigure:MODulation:EVMagnitude[:DQPSk]:CONTrol:REPetition	6.27
CONFigure:MODulation:EVMagnitude[:DQPSk]:EREPorting	6.26
CONFigure:MODulation:MERRor[:DQPSk]:CONTrol	6.41
CONFigure:MODulation:MERRor[:DQPSk]:CONTrol:DEFault	6.42
CONFigure:MODulation:MERRor[:DQPSk]:CONTrol:REPetition	6.41
CONFigure:MODulation:MERRor[:DQPSk]:EREPorting	6.40
CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit:FTSYmbols	6.23
CONFigure:MODulation:OEMP[:DQPSk]:AVERage:LIMit[:WBURst	6.22
CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit:FTSYmbols	6.22
CONFigure:MODulation:OEMP[:DQPSk]:CMMax:LIMit[:WBURst	6.21
CONFigure:MODulation:OEMP[:DQPSk]:LIMit:DEFault	6.23
CONFigure:MODulation:PERRor[:DQPSk]:CONTrol	6.34
CONFigure:MODulation:PERRor[:DQPSk]:CONTrol:DEFault	6.35
CONFigure:MODulation:PERRor[:DQPSk]:CONTrol:REPetition	6.34
CONFigure:MODulation:PERRor[:DQPSk]:EREPorting	6.33
CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol	6.20
CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol:DEFault	6.21
CONFigure:MODulation[:OVERview][:DQPSk]:CONTrol:REPetition	6.20
CONFigure:MODulation[:OVERview][:DQPSk]:EREPorting	6.19
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol	6.10
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol:DEFault	6.11
CONFigure:POWer[:NBURst][:DQPSk]:CONTrol:REPetition	6.11
CONFigure:POWer[:NBURst][:DQPSk]:EREPorting	6.9
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[SENSe:]RXQuality:MAHO:NCELls:CELL<nr>?	*6.78*
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ABORt:MODulation:PERRor[:DQPSk]	*6.33*
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